Land & Water Resources Research & Development Corporation

Annual Report
1999–2000

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Land & Water Resources
Research & Development Corporation

Quality System
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Senator the Honourable Judith Troeth
Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry
Parliament House
CANBERRA ACT 2600

Dear Minister,

LWRRDC Annual Report: 1999–2000

In accordance with Section 28 of the *Primary Industries and Energy Research & Development (PIERD) Act 1989*, and Section 9 of the *Commonwealth Authorities and Companies Act 1997 (CAC Act)*, I have pleasure in presenting to you the 1999–2000 Annual Report of the Land and Water Resources Research & Development Corporation (LWRRDC).

To demonstrate that the Corporation is meeting Commonwealth Government reporting requirements, an Index of Compliance is provided.

The past year has been one of significant change for the Corporation. It saw the commencement of a new Board and the appointment of a new Executive Director, following Dr Phil Price's resignation. I am sure you will agree that Dr Price made a wonderful contribution to the Corporation over the past nine years.

Systematic independent evaluation of the Corporation's research portfolio during the year revealed that the national research and development programs established and managed by the Corporation continue to generate a substantial positive return on investment. LWRRDC is primarily concerned with public benefit issues through enhanced sustainability of the resource base for primary industries. These public benefits are notoriously difficult to quantify and measure, which means that estimates of the return on public investment of research funded through the Corporation are likely to be conservative.

The strategic directions established by the Board during 1999–2000, and consolidated in the new R&D Plan 2001–2006 (in development), primarily ensure that the research funded by the Corporation is directed to where it can make the biggest difference on priority national issues. This strategic process also ensures that research outputs are relevant and influential.

LAND & WATER RESOURCES RESEARCH & DEVELOPMENT CORPORATION

The Board has significantly increased investment in an enhanced communication effort to translate R&D outputs into activities, products and services that are of practical use for their intended end users. We have continued to strengthen the links between research outputs and the programs of the Natural Heritage Trust (NHT) in order to help the Government maximise the national benefit derived from NHT activities.

We have taken major steps to improve cross-program integration and to focus more at the landscape/catchment scale. Recognising that many resource degradation issues cannot be tackled just through changing farming practices, we have also enhanced research attention to the social, economic and institutional dimensions of natural resource management.

We are looking to enhance our already very sound linkages with industry through more partnerships with commodity-based R&D Corporations. We continue to bring scientists, policy makers and resource users together in the design and management of our R&D programs.

LWRRDC continues to enjoy strong support from Government agencies, rural industry bodies, community groups and research organisations. We are building on these collaborative partnerships. We greatly appreciate the willing cooperation shown by many organisations and individuals in supporting the national programs we have established.

We look forward to maintaining this collaborative approach to the sustainable and productive use of Australia's natural resources. Research and development highlights for 1999–2000 are described within the Annual Report. I commend it to you.

Yours sincerely,

A D Campbell
Chairman

4 September 2000

Att: LWRRDC Annual Report 1999–2000

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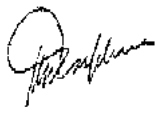
Certification

I hereby certify that the 1999–2000 Annual Report for the Land and Water Resources Research & Development Corporation has been prepared in accordance with a resolution of the Directors of the Corporation.

The date of the Annual Report is 30 June 2000.

The Directors are responsible under section 9 of the *Commonwealth Authorities and Companies Act 1997* for the preparation and content of the Report of Operations in the Annual Report in accordance with the Finance Minister's Orders.

Signed this first day of September 2000.



A.D. Campbell
Chairman

C.A. Campbell
Executive Director

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2 Chairman's Report

The 1999–2000 year has been a year of significant strategic change for the Land and Water Resources Research & Development Corporation. The strategic shifts in direction and priorities overseen by the Board included:

- greater focus at the regional/ catchment/landscape scale: integrating R&D products across programs, developing tools and methodologies to inform policy and management at this scale and working with practitioners to ensure that onground implementation is informed by the best available science;
- greater emphasis on researching the social, institutional and economic issues which may be constraining the development and adoption of more sustainable natural resource management, and on identifying opportunities for reform to create a more enabling environment for sustainable natural resource management;
- a move to fewer, larger, carefully-targeted R&D programs where LWRRDC can make a difference, integrating biophysical issues with social, economic and institutional issues;
- enhanced activities in partnership with industry, particularly through working with other R&D Corporations (RDCs); and
- a greater focus on enhancing adoption of existing knowledge, recognising that R&D must be relevant to real and perceived needs

of key players if it is to influence behaviours, policies and institutions and ensuring that R&D outputs are communicated effectively in forms most useful for their end users.

The LWRRDC Board also recognises that the public good issues that are the focus of most of its research effort present major communication challenges. Natural resource management does not have a long-established extension infrastructure within State agencies and agricultural industries, in the same way that production-oriented agricultural R&D enjoys.

Many of the issues operating at a catchment or landscape scale cannot be reduced to simple prescriptions for each crop, paddock or property. Policy audiences are very different from land user audiences in the way in which they seek, exchange and use information. The Corporation needs different communication strategies for different clients.

The Board has decided to quadruple its overall investment in communication activities, from a base of less than 5% of the Corporation's core appropriation to almost 20%.

Apart from the obvious reasons – R&D is of no value unless someone uses the findings – communication receives special attention from LWRRDC because it has traditionally not been done well in Australia, particularly in the area of sustainable natural resource management.

After a decade of targeted investment in more than 1,000 research projects to generate knowledge, a very considerable body of information and insights has been created. The new Board is not convinced that Australia has yet received the full potential return on this investment.

In evaluating communication investment, as in our R&D programs, decisions are based on national significance, likely return on investment (ROI) of taxpayer funds and the ability of the Corporation to make a real difference to practical outcomes. The Corporation is aware that the crucial integration challenge is not so much at the level of the research project, or even program, but rather in communicating research outputs in ways that are useful for particular audiences.

For example, a catchment manager does not want separate research outputs in quite different styles and formats across groundwater, salinity, riparian, irrigation, contaminants and remnant vegetation programs. Rather, they want an integrated package of information, tools and methodologies drawing on and synthesising R&D outputs from across these areas.

Last year, I reported the Board's decision to concentrate its attention and staff resources on the following natural resource management issues:

- sustainable agriculture in a variable climate;
- dryland salinity;
- redesigning agriculture for Australian landscapes;
- social, institutional and policy issues;
- river restoration and management;
- sustainable irrigation industries; and

- sustaining vegetation in rural landscapes.

This consolidation process took effect through 1999–2000, and is being progressed further in the Strategic R&D Plan for 2001–2006. We continue to fund innovative, complementary and catalytic projects within our General Call. We have also continued our active participation and support in the R&D programs managed by others; for example the Sustainable Grazing Systems (SGS) Program managed by Meat and Livestock Australia and the Joint Venture Agroforestry R&D Program managed by RIRDC.

The National Land and Water Resources Audit, a program of the Natural Heritage Trust (NHT), continues to make good progress. Work is well advanced on all of the Audit's seven major Themes. The Audit and its Management Unit are working to ensure that contracted projects meet their objectives, and to develop publicly-available products that will assist natural resource decision-making by governments, industry groups and community organisations.

The 1999–2000 year saw significant changes at the top of the Corporation. In my last report, I farewelled retiring Board members Don Blackmore, Christine Forster and John Taylor. It gives me great pleasure to welcome as new directors Stuart Bunn, Sheila Donaldson and Mike Logan, who bring a wealth of practical experience and business and scientific expertise to the Corporation. They have already made their mark in Board and committee meetings and I look forward to their contribution over coming years.

Dr Phil Price completed his third three-year contract as Executive Director of LWRRDC at the end of 1999. I should like to make special mention of the outstanding contribution Dr Price has made to the work of the Corporation.

In effect, Phil has directed and managed the Corporation from its inception. Over the last nine years he has overseen the development and implementation of groundbreaking research and development programs in natural resource management. Moreover, he has developed, virtually from scratch, all of the systems for identifying, scoping, prioritising and managing collaborative research programs.

The conceptual clarity, scientific credibility of and respect for LWRRDC programs revealed through recent stakeholder surveys is, in large measure, due to the rigour and insight Phil has brought to the oversight of the Corporation's research management systems. I am delighted that Phil will not be lost to the Corporation, as we have managed to secure his services to coordinate the National Rivers Consortium.

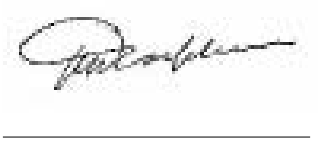
On behalf of the Board, I would like to pass our special thanks to Phil and his partner Keren and to wish them well for the future.

I am very pleased to welcome our new Executive Director, Mr Andrew Campbell, who commenced duties in February 2000 after four years as a senior executive in Environment Australia, in particular managing the Bushcare Program. Mr Campbell has an unusual blend of experience and

expertise in natural resource management policy, research, extension and onground management. His work in property planning and landcare has been influential at a national level. I look forward to working with him to build on the very sound platform established by Phil Price.

I would again like to record the sincere thanks of the Corporation to the many government agencies, other funding bodies, catchment and landcare groups, and researchers and their organisations who continue to provide a high level of support and collaboration within our R&D portfolio. The active participation of these many individuals and organisations is crucial to the success of our programs, and to the high level of return being achieved on the investment of public funds into natural resource management R&D.

Finally, I would like to thank the staff of the Corporation who have maintained a high level of performance and professionalism during a year of significant change. They continue to be our best and most productive asset.



A.D. Campbell
LWRRDC Chairman

3 Glossary of Terms

ABOA	Australian Bibliography of Agriculture
AFFA	Agriculture, Fisheries and Forestry – Australia
ANAO	Australian National Audit Office
ANCID	Australian National Committee on Irrigation and Drainage
ANU	Australian National University
ANZLIC	Australia New Zealand Land Information Council
AOP	Annual Operational Plan
APEN	Australasia Pacific Extension Network
APSIM	Agricultural Production Systems Simulation
ARRIP	Australian Rural Research in Progress
Audit	National Land and Water Resources Audit
AUSRIVAS	Australian River Assessment Scheme
CAC Act	*Commonwealth Authorities and Companies Act 1997*
COAG	Council of Australian Governments
CRC	Cooperative Research Centre
CRCFE	CRC for Freshwater Ecology
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVAP	Climate Variability in Agriculture R&D Program
DRDC	Dairy Research & Development Corporation
DSS	Decision Support System
EA	Environment Australia
EDYS	Ecological Dynamics Simulation

EFDSS	Environmental Flows Decision Support System
EFMI	Environmental Flows Management Initiative
ESD	Ecologically Sustainable Development
FFP	Frequent Flyer Points
FNARH	First National Assessment of River Health
FOI	Freedom of Information
FWPRDC	Forest and Wood Products R&D Corporation
GIS	geographic information systems
GRDC	Grains R&D Corporation
GST	Goods and Services Tax
IAA	Irrigation Association of Australia
ISO	International Standards Organisation
JVAP	Joint Venture Agroforestry R&D Program
LWRRDC	Land & Water Resources Research & Development Corporation
MDBC	Murray-Darling Basin Commission
MLA	Meat & Livestock Australia
MRHI	Monitoring River Health Initiative
NDSP	National Dryland Salinity Program
NEMP	National Eutrophication Management Program
NFF	National Farmers' Federation
NHT	Natural Heritage Trust
NPIRD	National Program for Irrigation R&D
NRC	National Rivers Consortium
NRHP	National River Health Program
NRM	natural resource management
NVIS	National Vegetation Information System
OGIT	Office of Government Information Technology
PIERD Act	*Primary Industries and Energy Research & Development Act 1989*
R&D	Research & Development
RAAL	Redesigning Agriculture for Australian Landscapes R&D Program
RDC	R&D Corporations
RIRDC	Rural Industries R&D Corporation
RMIT	Royal Melbourne Institute of Technology
SCARM	Standing Committee on Agriculture and Resource Management
SGS	Sustainable Grazing Systems
SIRP	Social and Institutional Research Program
SRDC	Sugar Research and Development Corporation
TFTA	Townsville Field Training Area
WUE	water use efficiency
www	World Wide Web

Report of Operations

4 Corporation Overview

Introduction

The Land and Water Resources Research and Development Corporation (LWRRDC or the Corporation) was established under the *Primary Industries and Energy Research and Development Act (PIERD Act) 1989*, with the purpose of 'the funding and administration of research and development relating to primary industries'.

The specific remit of the Corporation relates to the productive and sustainable management of land, water and vegetation resources. LWRRDC's basic purpose, then, is to utilise the full national R&D capability to help achieve the goal of sustainable management of the natural resources which underpin the rural primary industries and regional communities. As a Commonwealth Authority, the Corporation has a particular charter to foster and achieve national collaboration in order to improve the efficiency and effectiveness of this R&D effort.

LWRRDC is only one of several organisations involved in this endeavour. Responsibilities for natural resource management, whether for legislation, policy, programs or onground works, are distributed across all levels of government, community-based groups such as catchment committees and Landcare groups, rural industries and individual landholders. The funding provided to LWRRDC is equivalent to an estimated 3% of the total spent in Australia each year on natural resources R&D.

In order to discharge its responsibilities and meet its objectives within this context, the Corporation emphasises the establishment of national research programs, supported jointly by several partner organisations, and aimed at bringing together resource managers and researchers to jointly identify priorities and ensure that research findings are adopted and implemented.

Mission and role

Our mission is to provide national leadership in utilising R&D to improve the long-term productive capacity, sustainable use, management and conservation of Australia's land, water and vegetation resources. The Corporation will establish directed, integrated and focused research and development programs where there is clear justification for additional public funding to expand or enhance the contribution of R&D to sustainable management of natural resources.

The Corporation's role is to identify, fund and manage a portfolio of R&D programs to help achieve better and more sustainable use of natural resources and to help maintain the industries reliant on those resources.

Responsibilities

Within an annual government appropriation of about $11.0 M, the Corporation is responsible for R&D which helps support an irrigation industry worth $4.5 B/year, a dryland cropping industry worth $9 B/year, grazing industries worth $12 B/year and natural ecosystems and vegetation of inestimable value to the nation. The R&D it funds is directly aimed at protecting and enhancing the value of these industries, through ecologically sustainable use and management of natural resources. These industries, and the activities of Australian society, have triggered environmental problems such as waterlogging and salinisation, soil acidification, erosion, soil structure decline and pollution (by nitrogen, phosphorus and heavy metals) of many of the country's major rivers and waterways. The costs in lost production, and in prevention and remedial treatment of these problems, are estimated by the Corporation to be $2.5 B per year and rising.

Corporate objectives, strategies and performance indicators

LWRRDC's corporate objectives, strategies and performance indicators are set out in the 1999–2000 AFFA Portfolio Budget Statement and the Corporation's 1999–2000 Annual Operational Plan. These indicators are consistent with those in the LWRRDC 1996–2001 R&D Plan. The key performance indicators for each of the three major operating areas are listed below..

R&D

a. At least 80% of the LWRRDC budget is committed to programs and projects that have joint funding and close involvement from industry/ resource agency partners.

b. Analysis of random stratified samples of LWRRDC-funded R&D shows that mean benefits exceed costs by a ratio of at least 5:1.

c. Impact analysis of completed LWRRDC programs or projects

shows that results are being implemented and public benefits achieved in meeting Ecologically Sustainable Development (ESD) principles.

Communication

a. Communication strategies are developed and being implemented for 80% or more of R&D programs receiving LWRRDC funds.

b. There is at least 10% increase each financial year in the number of people seeking LWRRDC newsletters, publications or other information products.

c. Key research results from LWRRDC projects are publicised in appropriate ways within six months of receipt.

Management

a. Less than 5% of LWRRDC projects fail to meet their objectives without acceptable reasons.

b. The Corporation's administration expenses are kept at less than 7% of total expenditure.

Investment environment – opportunities and threats

The Corporation identified the following key opportunities and risks in managing its business during 1999–2000.

Opportunities

Alignment with Government priorities and programs

The Corporation has continued to align its R&D activities to government policies and programs. The increased national focus on major resource degradation issues, such as salinity and declining water quality, reflected in the establishment of a Cabinet natural resource management sub-committee and a related COAG process, increased the need for the strategic, nationally-focused and directed R&D in which the Corporation specialises. There were major opportunities for the Corporation to ensure that our investments line up with national policy needs as well as the needs of on-ground resource managers.

Collaboration with commodity-based R&D Corporations

As the only R&D Corporation which is not partly funded through industry levies, LWRRDC does not have the natural delivery mechanism of established industry structures through which to promote R&D outputs. We have to work harder to get land users at a farm level to develop a sense of ownership of our R&D, compared with R&D part-funded through producer levies.

One way around this is through collaborative partnerships with commodity-based R&D Corporations, through which LWRRDC can contribute natural resource management expertise, using well-established, industry channels as a delivery mechanism. We have built upon and added to the significant partnerships we already enjoyed with GRDC, RIRDC and MLA.

Regional/catchment organisations

There has been significant institutional reform in Australian natural resource management over recent years, exem-

plified by the creation of new organisational structures at catchment and regional levels. These organisations are now a major vehicle for public investment in environmental repair and restoration. They are consequently a growing user of LWRRDC-funded research and development. We have been working with these organisations to work out what sort of R&D they want and how they want the outputs delivered. We will also work with catchment managers to assist their take-up of research outputs, and to improve the feedback loop back into research program design and management, so that we stay in tune with the needs of end-users.

Improved marketing strategy for Australia, based on 'clean and green' image

The image of clean and green food production is potentially a major marketing strategy for Australia. It has been identified by the Minister for Agriculture, Fisheries and Forestry as a priority (see below). A challenge for LWRRDC has been to facilitate the adoption of accreditation systems and best management practices by industry, not only to meet market requirements but also to improve the long-term sustainable use of Australia's land, water and vegetation resources. Again, we have taken up this challenge primarily through partnerships with industry, through their RDCs where possible.

Threats

Communication/adoption

The biggest threat to the impact of LWRRDC-funded R&D is lack of or insufficient adoption of research outputs. There are several strategies to minimise this risk. The first is to ensure that research is relevant to real needs, ie. that there is a demand for the products of the research. Secondly, it is important to produce R&D outputs in forms that are useful to end-users. Finally, active communication of research outputs is required to ensure that intended end-users are aware of the work. Involvement of end users in research program/project design, and in project implementation can help to achieve each of these strategies.

The LWRRDC Board decided in 1999–2000 to increase its communication investment substantially, through a communication plan focused on increasing the adoption of LWRRDC-funded research and development. We also propose to put more effort into benchmarking communication effort and monitoring the adoption of R&D outputs. This has been undertaken with a primary goal of moving from 'output' to 'outcome' focused R&D.

Decline in resources provided by collaborative partners

The Corporation has been finding it progressively more difficult to secure partnerships within its R&D activities. Competition for R&D funding is growing and all research and NRM organisations are now trying to lever funds from other organisations to support their own initiatives. We have continued to foster partnerships by

engaging key stakeholders at the outset, to maximise ownership and adoption of R&D results.

The decline in research and extension capacity among State and Territory agencies responsible for agriculture and natural resource management has continued to be a major concern. These agencies play an important role in the Corporation's applied research effort and are essential participants in extension and implementation activities. Their regulatory and policy roles make them essential partners in many collaborative projects.

Local government agencies, non-government organisations and community groups are now taking a significant role in facilitating the adoption of natural resource management programs and activities by landholders. The Corporation is taking active steps to involve such organisations as partners in R&D programs and in delivery of research outputs. For example, we are currently negotiating such a partnership with Greening Australia Limited to enhance the delivery network for LWRRDC-funded R&D and to get better feedback into our programs from an extensive regional network.

Spreading resources too thinly

The natural resource management challenges facing Australia are huge. The LWRRDC budget is modest, so the Corporation has had to target its investment to where it meets high priority national needs, to where it can make a real practical difference and to where it generates a significant return on investment. These are the key filters used to screen potential investments, of which there are many. The risk of spreading resources across too many issues, such that none are dealt with properly, has been a constant threat to the effectiveness of the Corporation.

Inadequate research capacity

The Corporation has identified inadequate research capacity in a number of areas relevant to resource sustainability issues, including aquatic taxonomy, agroforestry, irrigation science and landscape and ecosystem function.

Dissemination and commercialisation activities

Each program and funded project has in place a detailed dissemination plan to ensure that the outputs of funded R&D are provided to the key beneficiaries or stakeholders, through different media including electronic (www), publication and field/demonstration activities. The Corporation has in place a protocol to effectively manage and mitigate the legal risks associated with communication and commercialisation activities.

Highlights of 1999–2000

- LWRRDC R&D programs, in association with the other RDCs, are helping landholders to diversify and produce new and improved high-value products (for example agroforestry products and productive use of saline lands) which satisfy the needs of both environmental sustainability and the domestic and export markets.

- From the National Remnant Vegetation R&D Program, a proposal by Binning and Young to allow a tax deduction for land valued over $5,000 that is gifted to conservation organisations has been adopted by the Commonwealth Government.
- For the first time in Australia, the National Land and Water Resources Audit has completed, under the National Dryland Salinity Program, a nationwide assessment of the groundwater systems that drive dryland salinity. This science-based framework links environmental processes with scale and types of management action required for effective salinity control and management.
- The first phase of the Redesigning Agriculture for Australian Landscapes R&D Program identified design principles to control water and nutrient leakage in agricultural systems, by comparing natural and agricultural systems. This leakage from current agricultural systems is the primary cause of dryland salinity, soil acidification and eutrophication of lakes and rivers. These principles have been incorporated into the MDBC Dryland Salinity Strategy.
- Options for institutional and policy arrangements for managing dryland salinity were developed under the National Dryland Salinity Program. These options were widely canvassed and have informed both the States' and the Commonwealth Government's and the MDBC's response to dryland salinity.
- The Australian Water Provider Benchmarking report, initiated by the LWRRDC-managed National Program for Irrigation Research and Development (NPIRD), was the first such report by any country in the world. The International Commission on Irrigation and Drainage has acclaimed the report, which was funded by the COAG Task Force, AFFA and NPIRD, as a model that could be used by all member nations.

  The report documents the performance of 46 irrigation water supply systems around Australia. It provides a framework to measure their performance in system operation, environmental issues, business processes and financial administration. In future, the benchmarking process will be funded and managed by the irrigation industry, through the Australian National Committee on Irrigation and Drainage (ANCID).
- The LWRRDC Board has committed $3 M, in partnership with $4 M from the CSIRO Chief Executive's fund and a further $9 M in CSIRO in-kind scientific resources, to develop a major new R&D initiative involving a wide range of stakeholders in the Ord-Bonaparte catchment in the East Kimberley region of Western Australia.

  The proposed five-year Ord-Bonaparte Program aims to look at an entire large catchment and its associated coastal and marine environs – from the top of the catchment to the continental shelf – taking an integrated approach to the social, economic and biophysical

issues in the catchment. The catchment encompasses a wide range of industries including pastoralism, indigenous land management, mining, irrigated horticulture, aquaculture and marine fisheries, and tourism. The future of the Program depends on the extent of matching funding contributions from industry and from government agencies in Western Australia, the Northern Territory and the Commonwealth.

- LWRRDC, in strategic collaboration with CSIRO Land and Water, the Murray-Darling Basin Commission and the WA Water and Rivers Commission, established the National Rivers Consortium to focus on the restoration of degraded rivers and the protection of the values of unimpacted rivers in Australia.
- Research in the National Eutrophication Management Program has shown clearly that while phosphorus and nitrogen are equally-important nutrients to algal blooms, their sources and pathways are different and so are the management actions. In addition, management of the light environment may be even more important than managing nutrients to control algal blooms in turbid Australian rivers. These findings have important implications for algal management policies.
- A groundwater/ecosystem interaction workshop showed several States are now developing policy in this area, following the report by Hatton and Evans (LWRRDC Occasional Paper 12/98 *Dependence of Ecosystems on Groundwater and its Significance to Australia*) two years ago.
- Tools developed under the Climate Variability in Agriculture R&D Program for incorporating seasonal climate forecasts into opportunity-cropping systems have been widely adopted by farmers in the northern grains regions. Double cropping has led to increased farm income while reducing land and water degradation through reducing recharge and runoff.
- A comparison between 1994 and 1999 surveys across the high rainfall zone showed powerful changes in attitudes and practices of the producers involved in the Sustainable Grazing Systems R&D Program. Significantly, producers are feeling more confident in their ability to actively manage their grazing systems for profit and sustainability, with far less blame attributed to external factors such as the weather and weeds.
- The Corporation commenced a Social and Institutional Research Program to build understanding of the social, economic, commercial, legal, policy and institutional drivers and constraints to improved NRM. An integrated information management system for catchment managers, and a process to evaluate integrated catchment management in wet tropical catchments, were communicated to State and Commonwealth government agencies and catchment management groups through publications, workshops and WebSites.

- The Natural Heritage Trust used the riparian lands guidelines developed by the LWRRDC-managed Riparian Lands R&D Program to assess best practice in riparian restoration.
- The Rehabilitation Manual for Australian Streams (Volumes One and Two) has been adopted by several State water agencies to promote the ethic of protecting resources in good condition. LWRRDC has approved funding for a second phase of the Riparian R&D Program to focus even more strongly on adoption issues.
- The Joint Venture Agroforestry R&D Program (JVAP) published preliminary guidelines to optimise biodiversity values when designing large softwood plantations. Owing to high demand, the *Design Principles for Farm Forestry* book (1997) was reprinted. These publications are available from RIRDC, which manages this Program in collaboration with LWRRDC, FWPRDC, MDBC and the Natural Heritage Trust.
- A collaborative approach by funding agencies with different key interests has enabled the North Australia Program (NAP), now in its final year, to cover a breadth of resource sustainability issues less feasible for the NAP operating alone on behalf of the beef industry. A Resource Management Panel, comprising representatives from the MLA, LWRRDC and Environment Australia, together with representatives from Landcare, the Australian Conservation Foundation and individual beef producers, provides advice to the Program.
- The current LWRRDC Board decided at its December 1999 meeting to have a stronger focus on R&D adoption, by increasing four-fold its overall investment in communication, from a base of less than 5% of the Corporation's core appropriation to almost 20%. This increased communication investment is also targeted at: improving LWRRDC's relationships with all parties involved in natural resource management; enhancing the promotion of LWRRDC's key role; educating present and future NRM managers; evaluating communication performance; and managing LWRRDC communication most efficiently.

Financial and Investing Activities

The Corporation receives general funding support from the Commonwealth Government of about $11 M each year. Additional funds are sourced from external partnerships within collaborative programs and other activities. LWRRDC also derives income from sources such as investments, royalties and sales of products, information and services.

As detailed in the audited financial accounts, the Corporation has maintained a low surplus of funds of $1.7 M at 30 June 2000 (1998–99 Amount: $1.5 M). The Corporation maintains only a small prudential reserve to cover contingencies in its R&D portfolio. All surplus funds are invested on deposit in Commonwealth approved banks. During the course of the reporting year, the Corporation ensured that it met its debts and obligations as they fell due.

Financial Summary Data

TABLE A. 1999–2000 SUMMARY OF ACTUAL AND BUDGET INCOME AND EXPENDITURE ($M)

	Budget $ M (1)	Actual $ M	Actual %	Explanation of Variance
INCOME				
Commonwealth appropriation	11.049	11.049	46	On budget
Natural Heritage Trust	10.432	9.020	37	Delay in program activities
Third party contributions (2)	3.956	3.178	13	Delay in program activities
Interest and other income	0.580	0.873	4	Additional return of R&D funds
TOTAL INCOME	**26.017**	**24.121**	**100**	
EXPENDITURE				
R&D Funding				
Commissioned R&D programs	11.997	11.026	46	Delay in program activities
National Land and Water Resources Audit (3)	10.512	9.132	38	Delay in contract completion – contractors from C'wealth, State, Territory agencies, research organisations and private consultants
General call	2.018	1.422	6	Projects transferred to commissioned R&D programs
Sub-total	24.527	21.581	90	
Communication	0.510	0.536	2	On budget
Strategic planning & management	0.070	0.408	2	Strategic planning process
Review & evaluation	0.030	0.069	1	Marginally over budget
Administration	1.035	1.289	5	Additional management activities
TOTAL EXPENDITURE ($ M)	**26.172**	**23.884**	**100**	
Deficit ($ M)	**(0.429)**	**(0.237)**		
Opening balance – 1 July 1999	**0.888**	**1.454**		
Closing Balance – 30 June 2000	**0.733**	**1.690**		

NOTES:

(1) As approved by Minister in 1999–2000 Annual Operational Plan (AOP).

(2) Third party contributions are disclosed in accrual terms. In 1999–2000, LWRRDC received $12.9 in cash terms.

Table B. 1999–2000 R&D Funding Allocation and Expenditure – $

Budget Item	Opening Balance	LWRRDC Budget	Third Party Contributions (2)	Interest/ Other Income (3)	Total Budget	Expenditure	Surplus
1. R&D PROGRAMS							
LAND RESOURCES							
Sustainable Grazing Systems (1)	-176,545	344,000	0	0	167,455	263,206	-95,751
National Dryland Salinity Program	151,530	1,051,500	885,000	14,610	2,102,640	1,380,530	722,110
Climate Variability in Agriculture R&D Program	1,232,587	109,300	1,386,916	132,715	2,861,518	1,672,812	1,188,706
Redesigning Agriculture for Australian Landscapes R&D Program	-16,193	611,500	0	0	595,307	279,031	316,276
North Australia Program	8,838	500,000	0	0	508,838	511,456	-2,618
R&D for Environmental Management of Military Lands Program	-112,244	0	146,488	8,059	42,303	51,950	-9,647
Social & Institutional Research Program	76,582	1,401,302	0	1,650	1,479,534	1,366,474	113,060
Ord-Bonaparte	0	0	0	0	0	630	-630
sub-total	1,164,556	4,017,602	2,418,404	157,034	7,757,595	5,526,089	2,231,506
WATER RESOURCES							
National River Health- R&D	446,684	68,908	0	38,472	554,064	305,088	248,976
National River Health – State/territory	56,885	0	0	800	57,685	32,925	24,760
National Eutrophication Management Program	110,304	336,260	360,000	40,420	846,984	649,263	197,721
National Groundwater R&D Program	116,682	515,000	0	42,636	674,318	543,540	130,778
National Wetlands R&D Program	-8,430	150,000	0	0	141,570	155,705	-14,135
National Program for Irrigation R&D	138,530	886,150	522,757	143,661	1,691,098	1,225,817	465,281
National Rivers Consortium	200,479	142,000	215,000	260	557,739	336,581	221,158
Riparian Lands	0	981,450	40,000	4,962	1,026,412	919,195	107,217
sub-total	1,061,134	3,079,768	1,137,757	271,211	5,549,870	4,168,114	1,381,756
VEGETATION							
National Rangelands R&D Program	77,089	666,222	25,000	0	768,311	534,530	233,781
National Remnant Vegetation R&D Program	45,573	341,250	0	0	386,823	287,601	99,222
Joint Venture Agroforestry R&D Program (1)	-2,942	515,000	0	0	512,058	510,107	1,951
Tropical savannah woodlands	2,779	0	0	0	2,779	0	2,779
sub-total	122,499	1,522,472	25,000	0	1,669,971	1,332,238	337,733
SUB-TOTAL COMMISSIONED R&D PROGRAMS	**2,348,189**	**8,619,842**	**3,581,161**	**428,245**	**14,977,436**	**11,026,441**	**3,950,995**
2. GENERAL CALL	0	1,305,123	116,922	0	1,422,045	1,422,045	0
3. National Land and Water Resources Audit (4)	289,016	0	9,511,198	79,085	9,879,299	9,132,901	746,398
TOTAL – R&D FUNDING	**2,637,205**	**9,924,965**	**13,209,281**	**507,330**	**26,278,780**	**21,581,387**	**4,697,393**

NOTES

(1) Managed by another R&D corporation

(2) Cash contributions provided by third parties

(3) Programs with external funds will have interest credited to program account

(4) Includes cash contributions from the NHT and other third parties.

5 Governance and Organisation

Corporate Governance

Corporate governance principles

The LWRRDC Board is committed to the highest standards of corporate governance, in accordance with required statutes and principles. The Board provides effective oversight and leadership of the affairs of the Corporation and ensures an independence from management.

The Board relies upon a range of measures to ensure that the Corporation is operating according to the accountability provisions of the *Commonwealth Authorities and Corporations Act 1997 (CAC Act)*, including: compliance checklists and internal and external audits; a due-diligence checklist and code of conduct for Directors; effective processes for the disclosure and management of conflicts (or perceptions of conflicts) of interest; a risk identification and management framework; and effective systems for monitoring performance and ensuring that the Corporation can meet its debts and other obligations as they fall due.

The Annual Report includes a comprehensive summary of corporate governance matters, including a description of how strategic directions, policies and processes have been applied during the year. The Board continually reviews policies and processes concerning all major areas of Board operations. A number of Board committees (including Communication, Finance and Audit), and other

committees of the Board as deemed necessary from time to time, act on the Board's behalf. Appropriate R&D program management committees are also established to oversee program design and management, ensuring that desired program outputs are being met and that partnership and Government funds are wisely spent.

Corporate status

LWRRDC is a statutory body, one of 14 R&D Corporations and one Council within the Agriculture, Fisheries and Forestry portfolio. It was created on 3 July 1990 under the *Primary Industries & Energy Research & Development (PIERD) Act 1989*, which provides a foundation for its accountability to Parliament and to natural resource users and managers across Australia.

The *CAC Act* was enacted on 1 January 1998 and placed additional responsibilities on the Corporation and its Directors and officers.

Parliamentary accountability & ministerial powers.

The Corporation is accountable to the Minister for Agriculture, Fisheries and Forestry, who is empowered by the *PIERD Act* to:

- approve the Corporation's R&D Plans, Annual Operational Plans and variations to both of these plans, assessed against the objects set out in the Act;
- select and appoint the Chairperson and Government Director to the Board, and appoint the Presiding Member and other members to the LWRRDC Selection Committee for Board positions;
- approve the nominees for membership on the Board; and
- transfer contracts, agreements and assets held in the name of the Commonwealth to the Corporation.

From 21 July 1999, the responsible Minister for the reporting period was the Hon. Warren Truss MP. The Hon. Mark Vaile MP was the responsible Minister until 20 July 1999. The Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry was Senator Judith Troeth. Under the *CAC Act*, the Minister must table the Corporation's Annual Reports in Parliament.

The Minister is responsible for the Corporation's enabling legislation and is in turn answerable to Parliament. The Minister also has other discretionary powers (provided through section 143 of the Act) to give written directions to the Corporation as to the performance of its functions and the exercise of its powers. The Minister has directed the Corporation to include in its Annual Reports details of energy use by the LWRRDC office, and of the Corporation's commitment to the Government's ESD initiative. (see pp. 5, 26 & 33).

The Corporation is also obliged to ensure compliance with any policies of the Commonwealth Government of which it is notified by the Minister under the *CAC Act* (s.28).

Representative organisations

In addition to its accountability to the Minister, LWRRDC is accountable to two representative organisations, which

represent the interests of key natural resource users and managers.

Details of both planned and actual payments of consultation costs, consistent with the powers available to the Minister under Section 16(1)(b) of the *CAC Act 1997*, are provided later in this chapter.

The representative organisations in 1999–2000 were:

Australian Conservation Foundation
Mr Don Henry
Executive Director
340 Gore Street
FITZROY VIC 3065.

National Farmers' Federation
Dr Wendy Craik
Executive Director
PO Box E10
Kingston ACT 2604.

Stakeholders

LWRRDC sees its stakeholders as:

- the two representative organisations, as listed above;
- funding bodies, including the Commonwealth Government and other agencies that provide collaborative support within commissioned R&D programs;
- landholders, community groups, State agencies and local government who are involved in the use, management, regulation or conservation of Australia's land, water and vegetation resources;
- consultants, advisers, research organisations and researchers who provide advice and direction and new knowledge on the improved management of Australia's land, water and vegetation resources; and
- the general community, as owners and beneficiaries of natural resources and as taxpayers who fund the Corporation.

Further details on collaborating organisations within commissioned R&D programs are discussed in the status reports on the individual R&D programs.

Enabling legislation

Functions (Section 11, PIERD Act)

The functions of the Corporation are: to investigate and evaluate the requirements for R&D relevant to issues affecting the management of land, water and related vegetation resources; to coordinate and fund R&D activities; to monitor, evaluate and report to Parliament, the Minister and representative organisations on R&D coordinated and funded by the Corporation; and to facilitate the dissemination, adoption and commercialisation of the results of R&D.

The Corporation is able to enter into agreements and administration, employ staff, borrow money, form companies and participate in joint ventures, take out patents and determine its own internal structures and processes.

The Corporation may employ staff under its own terms and conditions and it may set up committees to advise the Board.

The Corporation may complement the expertise of its staff through the engagement of consultants as it deems appropriate. A full listing of consultants

used by LWRRDC during 1999–2000 is contained in the publication *Listing of LWRRDC-funded R&D: current projects and final reports*, to be published by the end of 2000. In addition, an abbreviated listing of R&D projects funded by the Corporation during 1999–2000 is included as an appendix to this Annual Report.

The Corporation has in place a risk assessment and management policy. This policy is consistent with the Commonwealth Government's best practice for fraud control.

The Board, in the development of its R&D Plans, is required to consult with its representative organisations. Consultation by the Board on matters affecting Corporation operations extends to researchers, research administrators, resource users and resource management agencies.

Powers (Section 12, PIERD Act)

The powers of the Corporation enable it to enter into agreements for carrying out R&D activities, make applications for and deal with patents vested in the Corporation, charge for work or services rendered by the Corporation, accept gifts, grants and bequests, and act as a trustee of money or property vested in the Corporation, acquire, hold and dispose of real and personal property and join in the formation of companies and enter into joint venture agreements (s.14).

Objects (Section 3, PIERD Act)

The objects of the *PIERD Act* are to fund and administer R&D, with a view to:

- increasing the economic, environmental or social benefits to members of primary industries and to the community in general by improving the production, processing, storage, transport or marketing of the products of primary industries;
- achieving the sustainable use and sustainable management of natural resources;
- making more effective use of the resources and skills of the community in general and the scientific community in particular; and
- improving accountability for expenditure on R&D activities in relation to primary industries.

The chart on the next page details the linkages between LWRRDC objectives, and the strategies described in the R&D Plan and these four objects of the *PIERD Act*.

Revision of the R&D Plan and Annual Operational Plan

There has been no revision of the R&D Plan during the reporting period to 30 June 2000. The Minister approved an amendment to the 1999–2000 Annual Operational Plan in August 1999 to incorporate full program activity-based reporting. The Corporation is presently consulting with interested natural resource management agencies and individuals to revise the LWRRDC R&D Plan for 2001–2006.

***PIERD ACT* Object**	**Link to LWRRDC Mission and Objectives**
A. Increasing the economic, environmental or social benefits to members of primary industries and to the community in general by improving the production, processing, storage, transport or marketing of the products of primary industries	LWRRDC states in its Mission Statement and objectives, "to improve the long-term productive capacity, sustainable use, management and conservation of Australia's land, water and vegetation resources". This is also demonstrated by LWRRDC's commitment to establish linkages with commodity R&D groups. The R&D and Communication objectives of our R&D Plan relate closely to environmental and social benefits from improved production methods.
B. Achieving the sustainable use and sustainable management of natural resources	This object constitutes LWRRDC core business and there is a direct link with the LWRRDC mission and all three objectives of our R&D Plan.
C. Making more effective use of the resources and skills of the community in general and the scientific community in particular	The R&D objective and strategies state explicitly that LWRRDC will "involve all key groups in R&D programs" and "target appropriate R&D funding" in the design, funding and management of R&D activities. The strategy to "provide leadership in national R&D" is a key aspect of achieving object C of the Act. The communication objective clearly states that the Corporation will "ensure relevance and uptake of R&D results" to the community. Through funding postgraduate scholarships and travelling fellowships in identified areas of deficiency, the Corporation will enhance R&D capacity and make more effective use of the skills of the community.
D. Improving accountability for expenditure on R&D activities in relation to primary industries.	LWRRDC's management objective states "LWRRDC will evaluate and improve the efficiency, effectiveness, focus and balance of its portfolio of land, water and vegetation R&D". This objective provides a clear link to accountability for expenditure, and hence to achieving object D of the Act.

Section 28 (1) (v) – (viii) PIERD Act matters

The Corporation: has not commercially exploited a patent or granted a license under a patented invention; holds no interests in a company; has not undertaken any activities in relation to the formation of a company; and has had no significant acquisitions or disposals of real property during the 12 months to 30 June 2000.

Corporate objectives

Goal

The Corporation's goal is to direct and manage a limited amount of public funds to develop practical ways of preventing and reversing resource degradation. It is achieving this by identifying the major forms of resource degradation at the national level, helping determine the crucial barriers to sustainable use and management of those resources, and finding ways to harness the expertise and capabilities of the research community to overcome those barriers.

Broad objective

The *PIERD Act* requires the Corporation to fund R&D relating to primary industries, to increase the economic, environmental or social benefits to Australian primary industries and the community, achieve the sustainable use and management of Australia's natural resources, make more effective use of existing research skills in the scientific community and improve the accountability of expenditure upon R&D activities.

Specific objectives

R&D Objective: To develop, fund and manage R&D activities, where the Corporation's involvement in leadership, design, funding and management will significantly enhance the sustainable use, productivity and conservation of Australia's land, water and vegetation resources.

Communication Objective: To initiate, fund and manage activities in association with the Corporation's R&D portfolio that raise awareness of, exchange information about, and promote adoption of improved sustainable use, management and conservation of land, water and vegetation resources.

Management Objective: To evaluate and improve the efficiency, effectiveness, focus and balance of portfolio of land, water and vegetation R&D.

R&D activities

The Corporation has a broad charter and, during 1999–2000, it tackled a wide range of natural resource issues. To manage these issues effectively, the Corporation developed a management and reporting structure for its activities that allows resource users, the wider community and researchers to interact with the Corporation and assess its aims and performance. The structure also provides a framework for thorough assessment of issues and identification of objectives and priorities, enables efficient internal management of the research funding process, and supports development and effective external management of focused, integrated programs of R&D.

As well as large, integrated programs of research, referred to by LWRRDC as 'commissioned programs' and described in detail in the relevant sections of the chapter on Program Management, the Corporation supports a number of individual R&D projects.

Details on LWRRDC research projects

Details of all present LWRRDC-funded projects are entered onto the publicly-available online database, *Australian Rural Research in Progress* (*ARRIP*). *ARRIP* includes details such as project title, principal investigator, objectives, contact numbers and amounts of funding provided.

These details (except for project objectives and funding) are at Appendix 3. LWRRDC also publishes and annual Listing of LWRRDC-funded R&D (current projects and final reports. Copies will be available from the Corporation office, and from the AFFA Shopfront in Canberra, on freecall 1-800-020-157 from January 2001.

In addition, the listing publication is available as a searchable database at <www.infoscan.com.au>, which also hosts the *Streamline*, *ARRIP* and *ABOA* databases. *Streamline* is Australia's natural resources bibliographic database, and is supported by LWRRDC and the Water Services Association of Australia. *ABOA* is the *Australian Bibliography of Agriculture* database.

Abstracts of all final reports received by LWRRDC are entered onto *Streamline*. *Streamline* can also be accessed on CD-ROM. For further information on *Streamline*, contact Infoscan Pty Ltd on tel: (02) 6236 6267; fax: (02) 6236 6440 and email: <infoscan@acslink.aone.net.au>.

LWRRDC Board of Directors

Board structure (Section 16 and 131, PIERD Act)

The Corporation was established with nine Directors, whose task it is to develop policy, review research programs, evaluate the Corporation's performance and, where required, create committees and working groups to work on specific Corporation activities, such as finance, communication and commissioned programs.

The Board comprises a Chairman and a Government Director selected and appointed by the Minister, six non-executive Directors nominated by the LWRRDC Selection Committee and appointed by the Minister, and an Executive Director appointed by the LWRRDC Board. The Annual Report for the Selection Committee is attached.

Board members are selected to reflect a balance of expertise in appropriate areas. They are not appointed as representatives of the organisations or sectors with which they are associated.

Terms of appointment

The Chairman and Directors (except for the Government Director and Executive Director) are appointed for a term not exceeding three years, but are eligible for re-appointment. The Government Director holds office at the Minister's pleasure and the Executive Director holds office at the Board's pleasure. The present Executive Director has been appointed

for a three year period to 31 January 2003.

The previous term of the Board ceased at 30 June. The Minister agreed to extend the appointment of the Chairman for a further two years to conclude at 30 June 2001.

Directors

*Chairman – Alex Campbell**

(term 1 July 1999 to 30 June 2001)

'Tillgaree'
NARRIKUP WA 6151

Alex Campbell has farming interests which include sheep, cattle and farm forestry. He is a member of the National Land and Water Resources Audit Advisory Committee; and both the WA and Federal Greenhouse Committees.

He is Chair of the WA Salinity Council and is also a former General President of the WA Farmers' Federation and Board member of Landcare Australia Limited and Greening Australia.

*Executive Director – Andrew Campbell***

(term 31 January 2000 to 31 January 2003)
MSc (Wageningen), B. ForSc (Hons) (Melb), Dip.For (Creswick).

GPO Box 2182
CANBERRA ACT 2601

Andrew Campbell is a fifth generation farmer from western Victoria. He has been managing the family farm with the help of a neighbour since 1987, now focused on an expanding farm forestry enterprise.

He managed the Potter Farmland Plan project, and was Australia's first National Landcare Facilitator. His most recent position was manager of the Bushcare program under the Natural Heritage Trust.

*Government Director – Charles Willcocks**

B. Rural Science (Hons) (UNE), Diploma of Economic development (University of Glasgow)

Agriculture, Fisheries and Forestry – Australia
GPO Box 858
CANBERRA ACT 2601

Charles Willcocks is the Assistant Secretary, Natural Landcare Policy Branch, Department of Agriculture, Fisheries and Forestry - Australia.

Jason Alexandra

(term 1 July 1999 to 30 June 2002)

Alexandra and Associates
16 Homestead Rd
Eltham, Victoria 3095

Jason Alexandra has more than 20 years experience in natural resource management. He has commercial experience in agriculture, horticulture, forestry and consulting.

As a policy analyst and researcher he has authored numerous publications on NRM, environmental management, agroforestry and water. He has been a member of both the Murray-Darling Basin Community Advisory Committee and the National Board of Greening Australia.

Leith Boully

(term 1 July 1999 to 30 June 2002)
B. Rural Science (UNE); Postgraduate Diploma of Business Studies (UNE); CPAg

'Kelso'
DIRRANBANDI QLD 4486

Leith Boully is a wool, beef and cotton producer from Queensland. She is Chairman of the Murray-Darling Basin Community Advisory Committee, a member of the Australian Landcare Council and was previously a Commissioner of the Australian Heritage Commission.

Deputy Chairman – Warwick Watkins

(term 1 July 1999 to 30 June 2002)
AMP:ISMP (Harv.); Nat.Res. (UNE); Dip.Sci.Agr. (UNE); HDA (Hons)

NSW Department of Information Technology & Management
Level 19, Governor Macquarie Tower
1 Farrer Place
Sydney NSW 2000

Warwick Watkins is Director-General of the NSW Department of Information Technology and Management, which also encompasses forestry policy and structural adjustment, and the roles of Valuer-General, Registrar-General and Surveyor-General. He is a Director of Landcare Australia and former Commissioner of Soil Conservation for NSW.

Stuart Bunn

(new term 1999-2002)

(BSc Hons and PhD, both in Zoology at The University of Western Australia)

86 Garie Street
Wishart Qld 4122

Dr Bunn is Professor in Ecology and Director of the Centre for Catchment and In-Stream Research at Griffith University, Brisbane. He has extensive research experience on the ecology and management of aquatic ecosystems across tropical, temperate and arid environments, and has published widely in this field. Stuart serves on several State Government advisory committees and is currently a member of the Scientific Committee for Water Research for the International Council of Science.

Sheila Donaldson

(term 1 July 1999 to 30 June 2002)
B. Rural Science (Hons) (UNE); CPAg

110 Piper Street
TAMWORTH NSW 2340

Sheila Donaldson has a background in mixed farming in Northern NSW. She has represented the community as a member of State and national committees on natural resource management, including the MDBC Community Advisory Council and the Australian Landcare Council. She is a consultant specialising in catchment, property and strategic planning; and review of resource management.

Mike Logan

(term 1 July 1999 to 30 June 2002)

'Oakville'
NARRABRI NSW 2390

Mike Logan is a cotton, cereal and beef producer from Narrabri, NSW. He has achieved ISO 14000 - Environmental Management Systems accreditation for his farming operations, the first farm in the world to do so.

* Appointment by the Parliamentary Secretary to the Minister, not part of the Selection Committee process.

** Appointed by the Corporation.

Committees

From its establishment, the Corporation set up committees to deal with the matters affecting the Board. In 1999–2000, the committees were:

- **Audit Committee**, comprising four Directors and the Corporation's Business Manager, which was established to monitor the financial systems, operations and accounts of the Corporation.
- **Finance Committee**, comprising two Directors, the Business Manager and the Executive Director, which was established to consider financial matters affecting the Corporation and to make appropriate recommendations to the Board.
- **Communication Committee**, comprising three Directors, the Executive Director and the Communication Manager, which was established to develop a communication strategy for the

Directors' committee membership and attendance at meetings

		Committees		
Director	**Board Meetings**	**Audit**	**Finance**	**Commu-nication**
Number of Meetings Held	**4**	**5**	**4**	**5**
Alex Campbell[1]	4	1	N/A	N/A
Phil Price[2]	2	N/A	2	N/A
Charles Willcocks	4	5	N/A	N/A
Jason Alexandra[3]	4	5	N/A	N/A
Leith Boully[4]	4	4	N/A	5
Warwick Watkins[5]	4	N/A	4	N/A
Andrew Campbell[6]	2	N/A	2	1
Sheila Donaldson	4	4	N/A	5
Mike Logan	4	N/A	4	N/A
Stuart Bunn	4	N/A	N/A	4

NOTES

1. Alex Campbell retired from the Audit Committee after its first meeting in 1999-2000.
2. Phil Price resigned as LWRRDC Executive Director in January 2000.
3. Chair of Audit Committee
4. Chair of Communication Committee
5. Chair of Finance Committee
6. Andrew Campbell commenced as the LWRRDC Executive Director in February 2000.

* N/A means that Directors are not members of the specified Committee.

Corporation and to ensure its longer-term implementation.

In addition, the Corporation has established other committees as required to assist in the management of specific R&D programs.

Freedom of Information

As a Commonwealth statutory authority, the Corporation is subject to the *Freedom of Information Act 1982*.

Categories of documents

Documents relating to research and development activities funded by the Corporation are held at the office in Canberra. They include:

Category	Nature	Access Code
Annual Operational Plan	Files	D
Annual Report	Files	D
	Publications	C
Applications and Agreements	Files and forms	D
Financial and project administration	Files & electronic data	D
	Publications	C
Information relating to commercialisation of R&D	Files	D
R&D Plan	Files	D
	Publications	C
R&D reports & Occasional Papers	Files	D
	Publications	C
Staff administration	Files	D

The following codes are used:

Access C: Documents customarily made available.

Access D: Documents not customarily made available due to privacy or commercial-in-confidence reasons.

FOI statistics

FOI Requests received	Nil
Internal review received	Nil
Administrative Appeals Tribunal appeals	Nil

Facilities & procedures for Freedom of Information (FOI) access

Members of the public can access and examine documents at the Corporation's office in Canberra by contacting the Business Manager on (02) 6257 3379. Office hours are Monday to Friday between 8.30 am and 5.00 pm. Access to the documents incurs a fee as prescribed under the *Freedom of Information Act*.

This statement is correct to 30 June 2000

Year 2000 compliance

The Corporation took all reasonable steps to mitigate the potential losses and expenses associated with the Year 2000 problem for electronic equipment and software. There were no reportable losses or damages to LWRRDC arising from Year 2000 problem.

Compliance with Ministerial Directions and General Policies of Government

a. Notification

Neither the Responsible Minister nor other Ministers have notified the Corporation of a Ministerial direction either:

(i) during the financial year; or

(ii) since the end of the financial year; or

(iii) continuing from previous years (except for the Corporation's commitment to the Government's ESD initiative, see p. 26; and LWRRDC's energy use (see p. 26).

b. Government priorities for rural research

The Government has indicated its ongoing financial commitment to R&D and recognition that the system of rural research and development corporations plays a critical role in taking science into the paddock. In December 1999, the Minister wrote to all RDCs outlining the Government's priorities for rural research to increase the competitiveness of Australia's rural industries. The Corporation's response against each of the seven priority areas is set forth below.

Sustainable natural resource management (NRM)

The Corporation's core business relates to protecting and enhancing the natural resource base that underpins rural Australia. Work ranges from developing a better understanding of the key processes that drive Australian ecosystems, to the effective uptake of improved management through industry best practice guidelines. LWRRDC works with the other R&D Corporations to ensure a coordinated R&D effort for NRM across each of the commodity industries.

Whole-of-industry approach

The Corporation ensures a whole-of-industry approach in all its collaborative activities with RDCs, such as incorporating ecological sustainability into the PROGRAZE farming systems package. The National Dryland Salinity Program has collaborative support with State resource management agencies, GRDC, RIRDC, MDBC and AFFA. This Program will develop a framework for appropriate resource allocation by governments and resource managers in managing dryland salinity. A whole-of-industry approach is required in managing this important national issue.

Biotechnology

The Corporation has worked with other R&D Corporations, to review the potential impact of biotechnology on the natural resource base.

Increase in trade and market access

LWRRDC R&D programs, in association with programs of the other RDCs, are helping landholders to diversify and produce new and improved high-value products (for example agroforestry products and productive use of saline lands) which satisfy the needs of both environmental sustainability and the domestic and export markets.

LWRRDC is also supporting the development of increased processing and value adding, through work into

the management and re-use of wastes from rural industries. Work on farming systems incorporates opportunities for new rural industries based on agroforestry and higher-value crops that are more suitable to the Australian environment.

Clean and green

The emergence of 'clean and green' marketing, and the threat of non-tariff trade barriers being imposed on Australia's exports, make LWRRDC's research vital in winning and maintaining overseas markets and in increasing farm productivity. Work funded by the Corporation is developing improved methods of resource management that are taken up by rural industries. It also provides a quantitative base for Australian industries to demonstrate their credentials in sound environmental management.

Rural industries are direct partners in many LWRRDC programs, thereby promoting a whole-of-industry approach that brings productivity and sustainability together. LWRRDC was also instrumental in developing a management system for pesticide use in the cotton industry by collaborating with a range of parties who have direct links to the cotton industry.

Food safety for consumers

LWRRDC has minimal, direct R&D responsibility for food safety. However, the Corporation cooperates with the commodity-based R&D Corporations, which have this direct food safety responsibility, to ensure food is sustainably produced through effective management of natural resources.

Improving our human resources

The Corporation is looking to expand the successful capacity-building program based on postgraduate scholarships, travelling fellowships and visiting fellowships. The Board has agreed to add a new category of community fellowships, directed to assist community members who have been involved in interesting or unusual activities in natural resource management, to take 'time out' over several months to write up their experience to draw out the lessons for a wider audience.

Postgraduate scholarships continue to be directed to areas where research capacity requires expansion. The Corporation assists researchers within its programs to upgrade their skills by providing joint support, with research organisations, for attendance at training workshops and courses. LWRRDC also provides a number of annual visiting and travelling fellowships to boost Australia's research capacity in areas of identified need. The Social and Institutional Research Program contributes to understanding the uptake and adoption of sustainable management practices.

c. Payments made to Representative Organisations

The Corporation expended about $20,000 during the reporting period for payments related to consultation with LWRRDC's Representative Organisations.

d. Ecologically Sustainable Development Program statement

Sustainable use and management of natural resources is the cornerstone of the Corporation's mission and the purpose of its policies and programs. As such, the Corporation has a major role in achieving the aims of the National ESD Program, developed during 1991–92. LWRRDC requires that 'sustainability' (both economic and ecological) of the natural resource is the over-riding objective when researchers and others are designing R&D projects and programs.

e. Energy Efficiency statement

The Corporation supports the enhanced Energy Management Program announced by the Commonwealth Government in October 1990 and the energy management guidelines announced in the Prime Minister's Environment Statement in December 1992. The guidelines call for improved energy efficiency in relation to vehicles, equipment and building design. The Corporation leases offices as part of a large office complex and does not own large, energy-consuming equipment or commercial vehicles.

f. Management of Frequent Flyer Points

The Corporation's finance policy states that frequent flyer points accumulated by staff and directors on LWRRDC business must only be redeemed for the benefit of the Corporation. At the end of each year, staff and directors are asked to identify FFP earned on Corporation business during the preceding year, and how they have used or will use these points.

g. Fraud control policy of the Commonwealth

The Corporation has in place a Fraud Control Plan that is in accordance with the Fraud Control Policy of the Commonwealth and the Corporation's risk management program.

h. Industrial Democracy and Equal Employment Opportunity

The Corporation's terms and conditions of employment promote a work environment free from discrimination in employment matters, ensuring application of the principles of merit and equity. The Corporation also promotes the principles of industrial democracy and a participative work place.

i. Legislation/regulations impacting on business

LWRRDC is required to comply with the Government's requirements for regulatory best practice arrangements when proposing new regulation or amending existing regulation which impacts on business. LWRRDC has not been involved in any regulatory proposals during the reporting period.

Compliance with Other Legislative Requirements

PIERD Act 1989, CAC Act 1997 and Auditor-General Act 1997

The Corporation has demonstrated compliance with the above legislation through the completion of a Compliance Index. The Corporation's legal advisers and Audit Committee have reviewed this checklist.

The Corporation has comprehensive insurance cover with the Commonwealth Insurer, COMCOVER, for its Directors and Officers. In accordance with the contract of insurance with COMCOVER, the Corporation is prohibited from disclosing details of insurance, as required under Division 3 Section 16 of the CAC Orders for the Report of Operations.

Reviews

There were no judicial decisions or decisions of administrative tribunals during the reporting period that have had or may have a significant impact on the Corporation's operations.

There were no reports from a Parliamentary Committee or the Commonwealth Ombudsman regarding the operations of the Corporation.

Significant Events

The Corporation did not notify the Minister of any significant events during 1999–2000.

Occupational Health and Safety (Commonwealth Employment) Act 1991

The Corporation has complied with the requirements in this legislation. The Corporation has in place an occupational health and safety policy as part of the terms and conditions of employment. During the year, a detailed workplace assessment was undertaken to ensure that each staff member has an effective work environment. There were no accidents and injuries during the year that resulted in significant leave by staff.

Administrative Decisions (Judicial Review) Act 1977

There were no administrative appeals during the reporting period.

Archives Act

The Corporation has complied with the requirements of the *Archives Act.*

Goods and Services Tax

The Corporation has effectively met the compliance and operational requirements of the Goods and Services Tax on its introduction from 1 July 2000.

Political Broadcasting and Political Disclosures Act 1991(Section 20

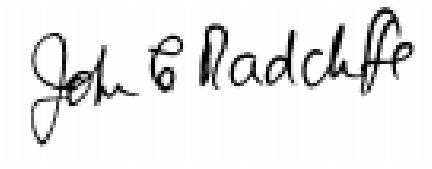
The Corporation expended about $38,000 during the reporting period towards direct mail organisations (excluding postage costs).

Report of LWRRDC Selection Committee

The Land and Water Resources Research and Development Corporation Selection Committee was formally abolished in July 1999, pursuant to section 129 of the *Primary Industries and Energy Research and Development Act 1989*. The Selection Committee was abolished after it had completed the task of nominating to the Minister, persons for appointment as new Directors of the Corporation for a three year term, from 1999–2002.

The Selection Committee was not formally recalled during 1999–2000 financial year, and as such, no Annual Report was submitted to the Minister.

It is currently not anticipated that the Selection Committee will be established during 2000–2001.



Dr John C Radcliffe

Presiding Member
Land and Water Resources Research and Development Corporation
Selection Committee

13 July 2000

Organisation structure

Location of office

The LWRRDC office is at the second floor, UNISYS Building, 91 Northbourne Avenue, Turner ACT 2612. The postal address is GPO Box 2182, Canberra ACT 2601. Contact numbers are:

Tel: (02) 6257 3379
Fax: (02) 6257 3420

E-Mail: public@lwrrdc.gov.au

WebSite: <www.lwrrdc.gov.au>

Structure

LWRRDC's organisation structure is shown in the chart presented on the following page.

Service charter

The Corporation has developed a service charter in line with the quality management system and as a basis for promoting greater stakeholder focus. The Corporation achieved ISO 9002 Quality Assurance Accreditation in 1996. The quality policy manual details the following service charter principles:

a. the Corporation shall verify that the requirements of stakeholders are identified and satisfied in a competent and professional manner;

b. LWRRDC products and processes shall be reviewed and aligned to reflect the needs of its stakeholders – this is achieved through close consultation and feedback with our key stakeholders; and

c. any variances to stakeholder requirements shall be dealt with in a timely manner, in accordance with the quality system.

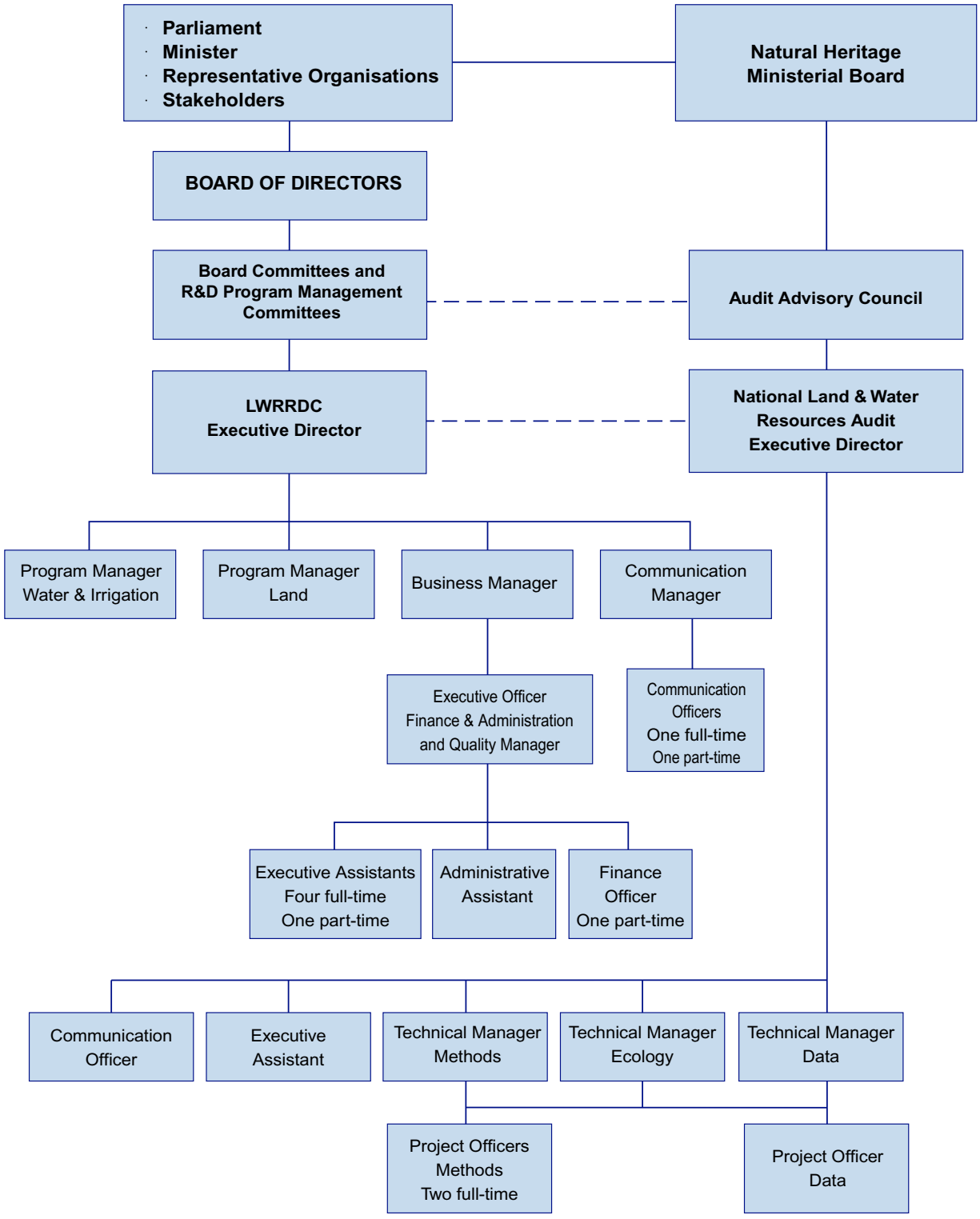
During the year, the Corporation demonstrated effective conformance to these principles through ongoing ISO accreditation and positive feedback from a stakeholder survey.

Executive and operating staff

Corporation staff carry out the day-to-day work involved in establishing R&D programs and in calling for, assessing, developing, implementing, supporting and reviewing funding applications. Staff are employed on terms and conditions determined by the Corporation. During 1999–2000, 16 full-time staff and four part-time officers were employed. An additional 12 full-time staff were employed as part of the Audit Management Unit.

Most executive and staff positions within LWRRDC have been restructured, effective from July 2000. This restructuring is reflected in the list of positions and responsible officers shown on page 31.

Figure 1. LWRRDC Organisational Structure (as at 30 June 2000)



Executive staff (effective 2000–2001)

Executive Director	Andrew Campbell
Integration Manager	Richard Price
Science Manager	Nick Schofield
Communication Manager	Christine Ellis
Business Manager	Sandy Lolicato
Communication Officer	Glenn Conroy
Communication Officer	Joy Sutton
Communication Assistant	Betsy Vucetic
Systems Controller	Kerri Morson
Business Services Officer (acting)	Jenny Nitschke
Financial Controller (part-time)	Rebecca Barnes
Finance Officer (part-time)	Bridget Agerbeek
	Maxine Nichols (resigned)
Program Officer (Rivers)	Bobbie Heath
Program Officer (Vegetation)	Gill Whiting
Program Officer (Sustainable Industries)	Christine Louis
Executive Officer R&D (acting)	Melanie King
Executive Assistant (acting)	Joanne Barbaro
	Andrea Schuele (resigned)

National Land and Water Resources Audit

Executive Director	Colin Creighton
Technical Director	Warwick McDonald
Technical Manager, Data	Stewart Noble
	Paul Shelley (resigned)
Technical Manager – Ecology	Jim Tait
	Ian Cresswell (resigned)
Information Specialist	Maria Cofinas
	Heping Zuo (resigned)
Project Manager	Rochelle Lawson
Business Manager	Sylvia Graham
Communication Officer (position closed)	Janice Oliver (resigned)
Project Officer – Methods (position closed)	Robert Scott (resigned)

Program Coordinators (external, part-time consultants)

Climate Variability in Agriculture R&D Program	Barry White
National Dryland Salinity Program	Nicholas Newland
National Rivers Consortium	Phil Price
	Brendan Edgar
Riparian Lands	Siwan Lovett
National Eutrophication Management Program	Richard Davis
National Program for Irrigation R&D	Brett Tucker
National Groundwater R&D Program	Graham Allison
National River Health R&D Program	Peter Davies
R&D for Environmental Management of Military Lands Program	John McIvor
Sustainable Grazing Systems R&D Program	Warren Mason
North Australian Program of R&D	Judy Lambert
National Remnant Vegetation R&D Program	Jann Williams
Joint Venture Agroforestry R&D Program	Ros Prinsley
National Wetlands R&D Program	Bill Williams
Redesigning Agriculture for Australian Landscapes R&D Program	David Clarke
Social and Institutional Research Program	Ken Moore

6 Summary of Achievements

R&D Investment

Objective

LWRRDC's objective is to develop, fund and manage R&D activities where the Corporation's involvement in leadership, design, funding and management will significantly enhance the sustainable use, productivity and conservation of Australia's land, water and vegetation resources.

Achievements and outcomes

This information is provided for individual programs in the next chapter.

Performance information

The following performance indicators for R&D Investment were identified in LWRRDC's 1999–2000 Operational Plan:

a. At least 80% of the LWRRDC budget is committed to programs and projects that have joint funding and close involvement from industry/resource agency partners.

With $20.1 M – 84% of LWRRDC's expenditure of $23.9 M – directed to jointly-funded projects and programs, this target was achieved during the year. The total value of partnership contributions to LWRRDC programs and projects in 1999–2000 was $37.9 M (159% of LWRRDC expenditure). This included:

- $12.2 M as cash and an additional $25.7 M as in-kind support by third parties and funded research

organisations. This compares with $37 M (130% of LWRRDC's budgeted expenditure) in 1998–99.

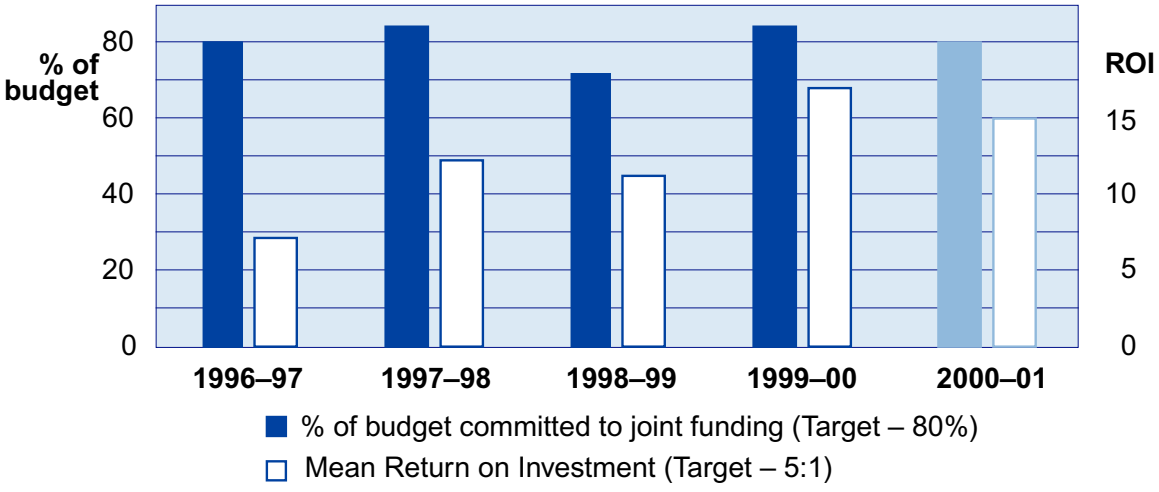
- Close involvement with industry and resource agency partners was achieved within the range of commissioned R&D programs, including:
  - partnerships with Meat and Livestock Australia in the Sustainable Grazing Systems R&D Program, with the Rural Industries R&D Corporation and the Forest and Wood Products R&D Corporation in the Joint Venture Agroforestry Program, and with the Grains R&D Corporation in the Environmental Management Systems Program;
  - National Dryland Salinity Program, involving the Grains R&D Corporation and the Rural Industries R&D Corporation; and
  - Climate Variability in Agriculture R&D Program, involving the Grains, Rural Industries, Sugar and Dairy R&D Corporations.

b. Analysis of random stratified samples of LWRRDC-funded R&D shows that mean benefits exceed costs by a ratio of at least 5:1.

The target was achieved. The Corporation undertook a synthesis of prior life of project evaluations which showed that the average benefit to cost ratio for 29 randomly selected projects was 17:1, well above the target of 5:1. This indicates that LWRRDC is achieving a good return on investment in natural resources R&D.

LWRRDC organised a workshop in December 1999 with a range of LWRRDC's key stakeholders to discuss the return on investment in natural resources R&D and implications for future evaluation. There was high acceptance of the framework for future life of project evaluations.

The chart below shows the record of achievement on objectives (a) and (b) for the past four years. Estimates of the projected accomplishment in the current year are also shown.



c. Impact analysis of completed LWRRDC programs or projects shows that results are being implemented and public benefits achieved in meeting Ecologically Sustainable Development (ESD) principles.

Three R&D Programs were formally reviewed during the year:

- the National Eutrophication Management Program (NEMP);
- the Rehabilitation and Management of Riparian Lands Program; and
- the National Groundwater R&D Program.

The review of NEMP concluded that, with one year remaining, it had already created some significant shifts in thinking and developed practical tools and guidelines for water and land managers. NEMP's impact on the knowledge base included better understanding of:

- the importance of nitrogen (in addition to phosphorus) and the light regime in controlling algal growth in inland rivers; and
- the relative importance of different phosphorus transport pathways in different landscapes including subsoil movement and the higher than expected bioavailability of phosphorus from dryland sources relative to sewage treatment plant sources.

NEMP has produced a range of influential information for managers including:

- guidelines for managing reservoirs and their catchments to minimise the potential for algal blooms;
- a national manual on algal sampling protocols;
- a land management geomorphic assessment technique and guidelines for sediment, nutrient and fertiliser control;
- flow management techniques for algal control in river pools and barrages; and
- iron strip and fluorescence equipment for on-site measurement of phosphorus bioavailability and detecting limiting nutrients.

The NEMP review noted the very high quality of the science conducted. Many results are still emerging in the final year of the Program. Further investment will be required to maximise uptake of the new management guidelines and tools developed.

The Riparian Lands R&D Program review found that it had laid excellent foundations for the future in terms of the science conducted and communication tools developed. The Program has raised the profile of riparian zone management to the point where Australia is on the brink of achieving major improvements in riparian zone and stream condition.

The economic benefits captured to date by the Riparian Program (now managed by LWRRDC in conjunction with the new National Rivers Consortium) were considered as minimal, since changes in riparian land management are only just starting to be

adopted. There are, however, large potential benefits to be captured in the future if there is increased adoption of the research findings.

The riparian research conducted was considered to be of exceptional quality and rigour, with some key findings concerning:

- the role of nitrogen in limiting in-stream growth;
- the positive role trees play in stabilising stream banks;
- the role of shade in controlling the growth of nuisance aquatic plants;
- the inability of aquatic organisms to utilise carbon derived from C4 plants – the C classification of plants relates to the different photosynthetic pathways plants use to fix organic carbon;
- the role of grass buffer strips in trapping sediment; and
- the value of demonstration and evaluation sites in raising awareness and motivating landholders to implement sustainable riparian management practices.

The Riparian Program has developed a solid base of high quality information products including:

- national riparian management technical guidelines, $25 plus postage/handling from the AFFA Shopfront on freecall 1-800-020157; and
- a Rehabilitation Manual for Australian Streams (Volumes One and Two), free on-line at <www.lwrrdc.gov.au/disclaimersrm.htm> or for $25 plus postage/handling from the AFFA Shopfront.

Although there is some evidence of improved awareness and adoption of improved riparian practices, the proportion of riparian lands managed appropriately remains low. Consequently, LWRRDC has approved funding for a second phase of the Riparian Program to focus more strongly on adoption issues. This will be achieved through analysing:

- key drivers of adoption;
- costs and benefits and cost-sharing frameworks; and
- policy and legislative improvements.

The mid-term review of the National Groundwater R&D Program found that it has had a big impact on groundwater management initiatives at the State agency level. This included uptake of groundwater vulnerability mapping and a strong push for information and research on groundwater-dependent ecosystems and fractured rock aquifers.

The groundwater review concluded that the Program has been successful in achieving its objectives to date and remained focused on the highest priority groundwater areas of diffuse-source pollution, groundwater ecosystems and groundwater allocation. Whilst more work is required in communication, it was found that all managers, policy makers and researchers were aware of the Program and that the profile of groundwater R&D had been raised.

The key stakeholders believed that LWRRDC has the national focus and organisational structure to continue to

enhance applied research in the groundwater area.

Communication

Goals and strategies

LWRRDC's communication objective is to initiate, fund and manage communication in association with its R&D portfolio in a way that raises awareness of, exchanges information about, and promotes adoption of improved practices for the sustainable use, management and conservation of land, water and vegetation resources.

The communication strategies from the LWRRDC 1996–2001 R&D Plan (in the process of revision for 2001–2006) are to:

- raise community awareness of land, water and vegetation R&D issues;
- ensure relevance and uptake of research results;
- raise awareness of LWRRDC activities among stakeholders, clients and the general public; and
- commercialise results of LWRRDC funded R&D where appropriate.

The strategies in a new LWRRDC Communication Implementation Plan, progressively being adopted from 2000 onwards, target outcomes in:

- Relationships.
- Adoption.
- Promotion.
- Education.
- Evaluation.
- Management.

Risks and specific opportunities

Relationships

The development of a broadly strategic approach in identifying the range of important organisations and key players has enabled LWRRDC to be open to opportunities as NRM issues come to public prominence. Conferences and other meetings provide an opportunity for LWRRDC to discuss central NRM issues with involved key players. Such liaison also helps to ensure that LWRRDC directions and R&D findings are recognised and used in developing policies and programs.

Adoption

LWRRDC's leveraged model of distribution of R&D information involves working through State/Territory agencies, consultants, other research funders and providers, and community group facilitators and coordinators.

Promotion

Publishing, both printed and electronic, continues to be a key communication strategy for LWRRDC. Increasingly, LWRRDC has placed a stronger focus on meeting the changing information needs of its research results end users, including both those involved in natural resource management on the ground and at policy levels. This trend will continue to categorise the Corporation's approach.

Education

LWRRDC's role in education in the past has been relatively small (investing some $4.5 M over eight years in more

than 60 postgraduate scholarships). This is an area of expansion for the Corporation, and in 1999–2000 LWRRDC increased from four to six the number of postgraduate scholarships to be awarded each year.

LWRRDC postgraduate scholarships are designed to train the next generation of R&D providers and natural resource managers (see the Postgraduate Update article in the LWRRDC *Intersect* newsletter Issue 21, February 2000).

Evaluation

LWRRDC's commissioned research programs are all independently responsible for program and project level communication. There has been a considerable range in the extent to which individual programs plan for communication. The Communication team continues to provide support to programs, in monitoring communication effectiveness and risk management.

Management

LWRRDC has accorded a higher priority to communication activities, with the Board decision made in 1999–2000 to substantially increase communication resources from 2000–2001.

Responsibility for communication implementation rests with everyone in the Corporation, to a greater or lesser extent. As such, there is a requirement for discussion and training to ensure all Corporation personnel are familiar with their responsibilities and contribute towards implementation of the LWRRDC communication strategy.

Achievements and outcomes

As the Corporation starts its 10th year of operation, and an increasing number of R&D projects mature to produce an increasing volume of R&D results, the number of communication products – such as publications – on offer to stakeholders also grows. The LWRRDC publications produced during 1999–2000 are listed in Appendix 1 (pp. 141–146.)

This same trend in the growing supply and demand for information to improve the management of Australia's land, water and vegetation resources is reflected in the expanding usage of the LWRRDC WebSite on the Internet. Automated figures on usage of the LWRRDC www site are at <www.lwrrdc.gov.au/usage/wusage>.

Selected LWRRDC publications are available to be downloaded from the LWRRDC WebSite. These On-Line publications include:

- *Listing of LWRRDC-funded R&D Current Projects and Final Reports*;
- *Stakeholders Report 1999*;
- *1999–2000 LWRRDC Annual Report*;
- *Impact of Research series of Occasional Papers*;
- *Greenhouse, carbon trading and land management*;
- *Issues in Natural Resource Management – data sheets*;
- *Cost of Algal Blooms; a Phytoplankton Methods Manual for Australian Freshwaters*;

- *Riverine and Wetland Salinity Impacts – assessment of R&D needs*; and
- *Self-Help Evaluation Framework for Integrated Catchment Management.*

Researchers and other stakeholders can also link directly to Australia's natural resources bibliographic database, *Streamline*, from the LWRRDC WebSite <www.infoscan.com.au>. At the WebSite, people can access *Streamline* as well as the *Australian Bibliography on Agriculture* (*ABOA*) and *Australian Rural Research in Progress* (*ARRIP*) databases, which are supported by LWRRDC and other agencies.

The following performance indicators for Communication were identified in LWRRDC's 1999–2000 Operational Plan:

a. Communication strategies developed and being implemented for 80% or more of R&D programs receiving LWRRDC funds.

Each of the R&D Programs receiving LWRRDC funds has a communication strategy in progress, at a program and/or an R&D project level. These strategies are discussed in each Program's Communication section, under Program Management.

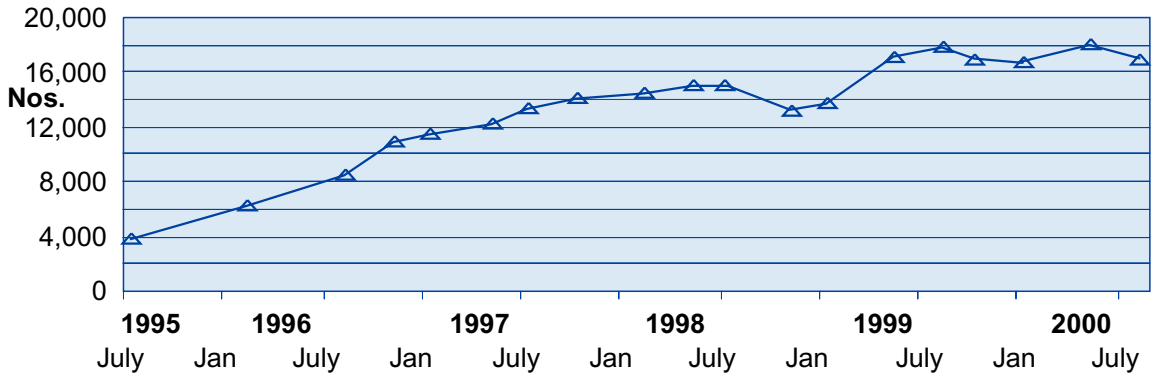
b. At least 10% increase each financial year in the number of requests for LWRRDC newsletters, publications or other information products.

Following a rationalisation of the LWRRDC mailing list, only requests for specific LWRRDC information are now received by people at their correct address. As a consequence, the number of listings for LWRRDC information on the database actually decreased 5.4% to 17,031, from 18,006 at 30 June 1999.

For example, the circulation of the *CLIMAG* newsletter for the Climate Variability in Agriculture Program, decreased by 1,277 during May/June 2000. This was due to the improved targeting of information to key people. As a result, savings are achieved through not sending copies to people not requesting or requiring the information.

The slowing in the growth of requests for LWRRDC information (23% in 1997–98; and 18% in 1998–99), and the 5.4% drop in 1999–2000, may reflect that LWRRDC is making improved use of electronic communication (eg. the Corporation's site at www.lwrrdc.gov.au) to distribute its R&D information.

The chart below shows the history of requests for LWRRDC publications from mid-1995 to the present.



In addition, LWRRDC publications from previous years continue to prove popular. For example, the series of Riparian Management Issues Sheets (first published in 1996–97) have gone to their third reprint to meet the demand from all States for this practical information covering:

1. Managing Riparian Lands.
2. Riparian Management for Streambank Stability.
3. Riparian Management for Water Quality.
4. River Ecosystems.
5. Land-Based Ecosystems.
6. Managing Stock in Riparian Land.
7. Snag Management.

Copies of these Riparian Management Issues Sheets are also available on-line at <www.rivers.gov.au>, as well as free-of-charge from the AFFA Shopfront on freecall 1-800-020 157. For details on LWRRDC publications see Appendix 1 – List of Publications. A full list of LWRRDC publications, organised under either corporate or commissioned R&D program categories, is also available under Publications at our WebSite <www.lwrrdc.gov.au>.

c. Key research results from LWRRDC projects publicised in appropriate ways within six months of receipt.

During 1999–2000, each of the 119 final reports received for communications assistance was, within six months of receipt, abstracted on the *Streamline* database and added to the collection at the AFFA Library. Free photocopies of all LWRRDC final reports are available through the AFFA Library by phoning (02) 6272 2143.

Australia's natural resources database *Streamline*, which is supported by LWRRDC, is available as a searchable database at <www.infoscan.com.au> on the Internet, linked to the LWRRDC WebSite at <www.lwrrdc.gov.au>. There are currently more than 46,259 records on the database (up from 43,750 in 1998–99), including details of every final report received by the Corporation.

In addition, selected final reports received additional communications assistance, eg. publication as an LWRRDC Occasional Paper (see Appendix 1) or mass media publicity as required.

Analysis of Performance

LWRRDC's performance is measured against performance indicators which indicate our outputs in the following areas: WebSite hits; number of publications; increase in requests for publications; and research results publicised in an appropriate way.

Future directions

The LWRRDC Communication Implementation Plan for 2000–2001 has the mission to establish a new benchmark in Australian science communication through translation of the Corporation's R&D outcomes into value-added and integrated services and products. The ultimate goal is to promote, inform and encourage the implementation of sustainable NRM practices across Australia. Much of the emphasis over the next year will be laying out the foundations for the

LWRRDC 2001–2006 R&D Plan. Particular focus will be on:

- Negotiating service agreements between LWRRDC programs and the communications team to avoid duplication of effort; to present the most coherent and professional picture possible; and to integrate communication products across R&D programs.
- Developing protocols at a project and program level for identifying key potential findings/policy implications/end users as early as possible, and weaving those into cross-program communication activities.
- Developing better indicators for tracking the influence of LWRRDC-funded R&D.
- Developing a system for identifying and extracting the 'gems' (ie. key research findings) from LWRRDC's R&D portfolio over the last decade, and in future years, and adding value through putting the 'gems' in a practical perspective for easier adoption.
- Exploring ways to ensure that data and information products generated through LWRRDC-funded R&D are managed consistent with the protocols developed by the National Land and Water Resources Audit.
- Improving linkages among Program Coordinators and between Program Coordinators and the Corporation, not just within the technical confines of R&D programs and processing milestone reports, but more corporately in contributing to LWRRDC's strategic direction.
- Working with all other RDCs to address the issue of how best the commodity RDCs can meet government and community NRM expectations.

The LWRRDC Communication Team is also responsible for internal communications. Over the coming year, the focus will be on developing and implementing a new performance appraisal system. This system will be based on multi-source feedback, and linking incentive bonuses to the achievement of individual and team goals.

Management

Goals and strategies

LWRRDC has as its objective to evaluate and improve the efficiency, effectiveness, focus and balance of its portfolio of land, water and vegetation R&D.

Achievements and outcomes

The Corporation is continuing to review the performance of funded R&D activities, to ensure that they are meeting their contractual outputs and outcomes. The Corporation is also implementing an improved information technology strategy to enhance internal management and administration of R&D programs and activities.

Analysis of performance

The following performance indicators for Management were identified in LWRRDC's 1999–2000 Operational Plan:

a. Less than 5% of LWRRDC projects fail to meet their objectives without acceptable reasons.

The target was not achieved. During 1999–2000, 37 out of 332 projects (11%) failed to meet contractual requirements at the specified date in the agreement (1998–99; 2%); ie. either the project was terminated (4) or there was an outstanding report without adequate explanation at 30 June (33). This increase from last year reflects tardy reporting, rather than failure to achieve contracted R&D objectives. The Corporation has tightened its policy on following up outstanding reports, including withholding payments and advising researchers that reporting performance of R&D providers will be reported in future Annual Reports of the Corporation.

The R&D objectives were achieved for all projects that had submitted final reports during the period. During 2000–2001, the Corporation will implement a further enhanced process of follow-ups as part of the development of an upgraded project management system.

b. The Corporation's administration expenses are kept at less than 7% of total expenditure.

The target was not met. The ratio of administration expenditure to total expenditure during 1999–2000 was 8.2%. This amounted to $1.3 M in administration expenditure, out of a total expenditure of $15.6 M (excluding expenditure under the National Land and Water Resources Audit).

The higher level of administration expenditure this year, in comparison to last year, reflects the increased costs due the introduction of the GST and additional staff costs associated with the development and implementation of a new strategic plan, an enhanced communication effort, the development of a new Project Management System, and greater emphasis on integration of effort across R&D programs. The LWRRDC Board has agreed that the target for administrative expenses should be a rolling average of 7% over a three-year cycle, and is looking to an increase in the revenue base to bring administrative expenses into line with this target.

The Corporation has in place systems and procedures to effectively manage the introduction of the Goods and Services Tax (GST) from 1 July 2000. The key issues addressed included transitional contracts, effective financial systems and procedures. All the recommendations arising from an internal audit report have been implemented in full.

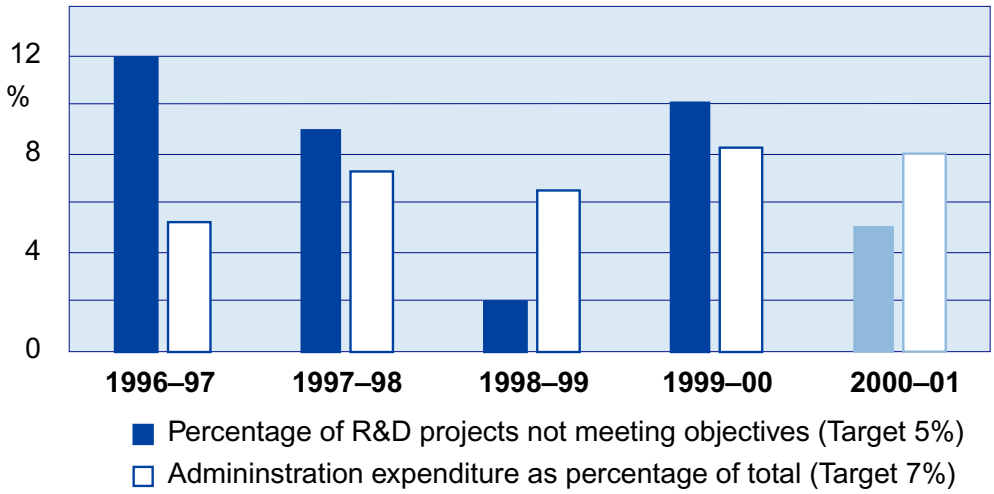
During 2000–2001, it is anticipated that administration expenditure will be maintained at around 7% of the total budgeted expenditure.

The chart opposite shows the Corporation's performance over the past four years in relation to objectives (a) and (b). Estimated performance levels for the year 2000–2001 are also shown.

Future directions

The current management strategies for the Corporation in the 1996–2001 R&D Plan are:

a. monitor R&D activities and assess outcomes;



b. develop an evaluation strategy to review LWRRDC programs and their effectiveness;

c. develop and revise R&D and Annual Operational Plans;

d. enhance R&D capacity as required; and

e. improve LWRRDC administration of R&D programs.

The Corporation, in its own administrative processes, will further develop the systems approach to R&D investment. The Corporation achieved international standard accreditation (ISO 9002) in May 1996 and will maintain its commitment to continuous improvement and the highest level of client service and accountability. These principles will be applied to assist the Corporation meet the highest standards of administrative efficiency and effectiveness, so matching the requirements that LWRRDC seeks from research organisations and others involved in its programs.

In addition, the Corporation will be implementing a range of improvements to its information technology systems to fully capture the benefits of electronic commerce and enable increased productivity gains in the office. LWRRDC will also have implemented effective systems and practices to manage the introduction of the Goods and Services Tax. LWRRDC will be developing a human resource management policy to cover the performance appraisal system, staff development and change management strategies emerging from the new business structure.

7 Program Management

Productive and Sustainable Land Use Systems

Sustainable Grazing Systems (SGS)

Goal and strategies

SGS was established in 1996 to address the issues of declining pasture productivity and sustainability in the grazing systems of the higher rainfall zone of Southern Australia (annual rainfall >600 mm).

A major factor in pasture decline in the higher rainfall zone has been the loss of perennial grasses. These grasses are both highly productive and ecologically important. A 1994 survey of producers showed that 44% expected their sown pastures to weaken and disappear within five years of sowing (80% in 10 years) – against the five to eight years it takes to recoup the costs of sowing a new pasture.

The result has been lower returns from livestock production, and increased rates of land degradation. Unfortunately, while animals drive the profitability of grazing systems, in the short term, animals are not a good indicator of the sustainability of a system. Land degradation is usually well advanced before there is a noticeable decline in animal production.

Rather than the traditional approach where research operates independently to develop and package information for producers, SGS has pioneered the bringing together of researchers, producers and extension agents into a partnership to collectively improve the

productivity, profitability and sustainability of grazing systems in the high rainfall zone. There are four interacting elements within SGS, each with its own key purpose:

1. **PROGRAZE®** – to assist producers gain the skills, knowledge and confidence needed to manage a grazing systems for profit and sustainability.
2. The **Regional Producer Network** – 11 regional producer committees to trial, refine, demonstrate and recommend locally credible grazing systems that will maximise profit and sustainability, and to extend/publicise those systems.
3. The **National Experiment** – to quantify the relationships between the management inputs and the production and environmental outcomes from grazing systems, and to provide some prototype testing.
4. The **SGS Model** – to provide a computer representation of grazing systems for interpretation and analysis of National & Regional Sites, and to provide a 'what if' capability for all sectors of SGS.

The SGS goals are to have:

- 2,000 producers adopt changes to their grazing systems that are at least 10% more profitable and more sustainable; and
- another 5,000 producers trialing at least some of the Program's recommendations.

SGS has completed four of the initial five years planned for the Program. Progress against these goals is on target.

Risks and specific opportunities

The major risk with SGS is that change will not be fast enough, compared to the seriousness of the production and environmental problems faced by producers in the high rainfall zone. Until recently, a major risk perceived by the producers involved in the Regional Committees was that MLA (and the other funders) might not have the patience to continue the work that the regions believe has only started – ie. making the grazing systems in the high rainfall zone more profitable and more sustainable. MLA has undertaken to pursue two key strategies for the future (see Future Directions).

The specific opportunities available to SGS include:

- regular contact with more than 12,000 producers in the high rainfall zone (55% of all producers);
- a network of 11 Regional Committees working to validate and demonstrate more productive and sustainable grazing systems; and
- collaboration between researchers and producers to share information, interpret results, and collectively plan future activities.

Now that credibility has been established with producers, SGS has the opportunity to bring environmental and resource management issues to producers in a non-threatening way.

Collaborating organisations

- MLA (lead agency)
- LWRRDC (funding partner)
- MDBC (funding partner)

- AFFA (funding partner)
- NSW Agriculture
- Natural Resources and Environment (Victoria)
- Agriculture WA
- NSW Land and Water Conservation
- Department of Primary Industries and Fisheries (Tasmania)
- Department of Primary Industries (South Australia)
- CSIRO
- Universities of Melbourne and New England
- Australian Museum
- Producers and producer groups across the high rainfall zone of Southern Australia

Achievements and outcomes

- The National FarmWalk, conducted in September 1999, was an outstanding success – 3,800 producers visited 55 sites across five States during the week-long event. For 2,300 producers it was their first involvement in an SGS activity. The FarmWalk edition of *Prograzier* (the SGS magazine) was the first colour edition and set new standards for content and quality. This magazine was responsible for attracting many new participants to the Program. The success was due to a collaborative effort between producers, researchers from the National Experiment, management and sponsors.
- *Prograzier* now reaches more than 12,000 producers across the high rainfall zone – about 55% of all producers. This newsletter is provided free-of-charge. Producers have to specifically request to be on the mailing list.
- The first SGS National Forum brought together all elements of the Program and provided a platform for producers to present the information from their Regional Sites, and for researchers to present the information from their National Sites, followed by collective discussion and interpretation. The Forum was hosted by the Northern Tablelands Region.
- In a substantial 'direct marketing' campaign, 16 SGS *Tips & Tools* (practical management guidelines for producers) were distributed across the high rainfall zone as a package in the *Prograzier* Magazine. The development of the *Tips & Tools* was a major collaborative effort across the research organisations and with producers.
- The innovative nature of the Regional Producer Network (and its establishment by Ian Simpson) was recognised through the Inaugural Award for Excellence in Extension by APEN, the Australasia Pacific Extension Network.
- PROGRAZE, the SGS training course, continues to exceed delivery targets, with a further 1,250 participants in 1999, bringing the total to 7,500 producers. In a critical development, PROGRAZE has been upgraded to include a major focus on the water cycle in grazing systems. This is in recognition that it is water that

drives both the productive potential and much of the sustainability of grazing systems in the high rainfall zone. This development was funded by a specific grant from AFFA.

- Development of the concept of a 'Harvest Year' for SGS – ie. a one-year extension to the Program, as outlined in the Future Directions section below.

Analysis of performance

There were no formal reviews of SGS during 1999–2000. However, a survey across the high rainfall zone showed some powerful changes in attitudes and practices of the producers involved in SGS. The following table compares attitudes and practices with a survey undertaken in 1994, just prior to the start of SGS. Significantly, producers are feeling more confident in their ability to actively manage their grazing systems for profit and sustainability, with far less blaming external factors such as the weather and weeds.

Biggest influence on pasture quality	1994 (%)	1998 (%)	change (%)
Rainfall	47	33	-30
Soil nutrients/fertiliser	42	74	+76
Weeds	34	11	-67
Grazing management	24	52	+116
Proportion of producers reactive in their decision making re grazing management	58	26	-55
Proportion of producers positive about making changes to their grazing systems (not asked in 1994)	–	75	

A major survey will be undertaken in April–May 2001 to determine the changes in attitudes, practices and performance of high rainfall producers over the life of SGS – ie. to determine the extent to which SGS has achieved its stated goal (see Goals and Strategies).

Communication

SGS has a formal communication plan, based on meeting the needs of four key target groups. The target groups, their approximate numbers, and the major communication activities undertaken in 1999–2000 are summarised below for the four target markets.

Target Market 1 – SGS Champions

(500 producers, sponsors, researchers – leading the development, trialing, adaptation and adoption of sustainable grazing systems.)

- SGS National Forum in Armidale, 22–24 March 2000.
- National FarmWalk.

Target Market 2 – Producers with PROGRAZE like skills

(7,000 producers who have completed PROGRAZE, many of whom are involved with national or regional sites and who are the most active producers in the network.)

- *Prograzier* newsletter.
- *Tips & Tools.*
- Activities at regional sites.

Target Market 3 – Producers desiring PROGRAZE skills

(1,500 producers who are currently completing PROGRAZE, or who have applied to undertake the course.)

- Support to undertake a PROGRAZE course.
- Activities at regional sites.
- National FarmWalk.

Target Market 4 – Producers not aware of SGS

(11,000 producers who do not know about SGS, or do not feel inclined to become involved.)

- Newspaper articles.
- National FarmWalk.
- ABC Television 'Landline' program.

Future directions

There are three major developments under way in SGS during 2000–2001 – planning future activities, bringing a focused sustainability course to PROGRAZE graduates and a redesign of *Prograzier*, the Program magazine.

1. Planning

The current SGS Program was planned for five years, up to June 2001. The Program Steering Group has decided that while the Program has made great progress towards improving the profitability and sustainability of grazing systems in the high rainfall zone, it is clear that:

- the momentum for large-scale change in grazing systems by producers has just started; and
- stopping the Program on 30 June 2001 would mean a lot of the time and money invested in SGS would not have had its full impact.

The Steering Group initiated a two-phase process. Phase 1 is a one year extension (called the 'harvest year'). Phase 2 is a totally new program to begin in July 2002.

The harvest year aims to capitalise on the investment in SGS, by driving the development of new products for producers and underpinning the development of a new Program. The harvest year is a joint venture (and collective effort) between the Corporation investors, agencies, universities and producers to switch the effort from data gathering to interpretation and integration. It will allow time for pausing, reflecting, testing, modelling, cross-theme analyses, and for developing robust rules, guidelines and Best Management Practices.

2. Developing a Focused Sustainability Course

With support from AFFA, the PROGRAZE course was upgraded during 1999–2000 to increase the focus on sustainability, specifically managing the water balance in grazing systems. However, this upgrade is too late for the 7,500 existing SGS graduates. With funding from the National Dryland Salinity Program, a focused course is being developed that will provide revision of PROGRAZE skills as well as specific training on managing grazing systems for sustainability – built around the SGS Sustainability Profile.

3. Redesigning Prograzier

Prograzier has over 12,000 producers on its mailing list. Future editions (beginning in August 2000) will be based on the SGS themes – water, nutrients, pastures, animals and biodiversity. The water edition (like other future editions) will be based around the question "what can I do on my property to manage ***water*** for profitability and sustainability?" Each edition will contain results from the National Experiment, guest columnists, and producer case studies.

For further SGS information, please consult Meat and Livestock Australia <www.mla.com.au>.

Climate Variability in Agriculture R&D Program (CVAP)

Goals and strategies

Climate research during the last decade is providing new tools to better manage a range of climate-related risks in agriculture and natural resource management. Some of the climate vagaries of Australia being 'a land of droughts and flooding rains' can now be managed through new understanding of the role of the oceans, as exemplified in responses to recent El Niño and La Niña episodes.

The Program's goal is to work with the Australian agricultural sector to develop and implement profitable and sustainable management strategies using climate information. These are strategies which prepare the agriculture sector to respond to the major opportunities and risks arising from climate variability.

CVAP takes its major direction from its unique national role to foster more effective collaborative approaches within the agricultural sector, and between agriculture and researchers in meteorology and oceanography. Tailoring climate forecasts to meet user needs, and incorporating feedback from applications research to climate research, both require close integration in research.

The Program maintains a balance between projects with shorter-term outcomes and some major strategic initiatives. Together, these projects and initiatives lay the foundation for improved understanding and prediction in the future.

CVAP has implemented four objectives to define the research strategies in the current phase. The first objective continues the development of improved seasonal forecasts through statistical approaches and climate models. The second is developing better-adapted farming systems. The remaining two objectives concentrate on communication and marketing aspects, which were given high priority in consultation workshops to plan the current Program phase.

The involvement of five R&D corporations in funding and management is a major feature and strength of CVAP. Decision support tools can thus be developed for specific industries as well as more generic tools of value in a wide range of industries and regions.

Risks and specific opportunities

The Program is a new focus for research. The major challenge is to

integrate new knowledge of climate variability into existing and routine approaches to managing climate-related risks. Approaches to ensure research projects are successful include using referees to establish scientific rigour; using Steering Committees to involve potential users of research; and funding projects which build on successful applications in other regions and industries.

Potential applications in the water industry will be feasible with the development of a streamflow-forecast version of Australian RAINMAN software. To date, data collection and analysis for this new streamflow version of RAINMAN has been completed. This follows increasing sales, including site licenses to major rural and regional organisations, of the new version of RAINMAN (funded with RIRDC).

There is considerable scope to make more effective use of seasonal climate forecasts in Southern Australia. New approaches based on the amplified impact of seasonal forecasts on crop and pasture production are being investigated. Improved communication of the probabilistic nature of seasonal forecasts has been a challenge for the program and is being addressed by research on farmer decision making.

The key opportunity being pursued by CVAP is to influence major sectors and organisations to develop a specific focus on climate variability in their planning and operations. Collaborative projects and generic tools are the two most effective ways for CVAP as a national Program to contribute.

Collaborating organisations

- LWRRDC (co-lead agency)
- AFFA (major funding partner).
- RIRDC (funding partner)
- GRDC (funding partner)
- SRDC (funding partner)
- DRDC (funding partner)
- NFF (Management Committee)

Achievements and Outcomes

Projects completed during the year have provided products and general-purpose tools that can be applied in a range of industries and regions. Difficulties in accessing relevant climate data in an easy-to-use format had been a major constraint on more widespread incorporation of climate analysis in farm and natural resource management decisions.

The mid-term review of CVAP concluded that overall the Program was achieving its objectives and had been particularly successful in developing collaborative approaches and a strong sense of partnership.

Completion of the SILO project resulted in a range of climate and weather data being more readily available. CVAP products are being used in targeted training and extension programs for managing climate risk in some States.

There has been increasing international recognition of the world-class research by CVAP in developing and applying seasonal forecasts. For instance, seasonal temperature outlooks based on CVAP research on Pacific and

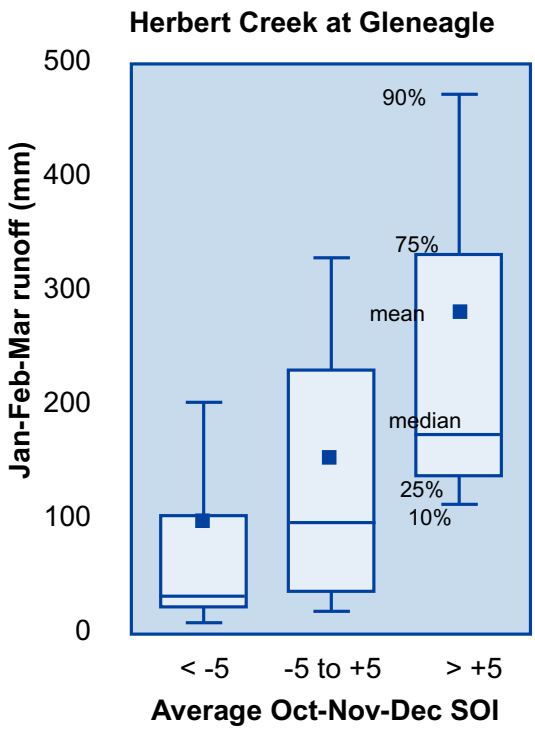
Indian Ocean temperatures are now operational.

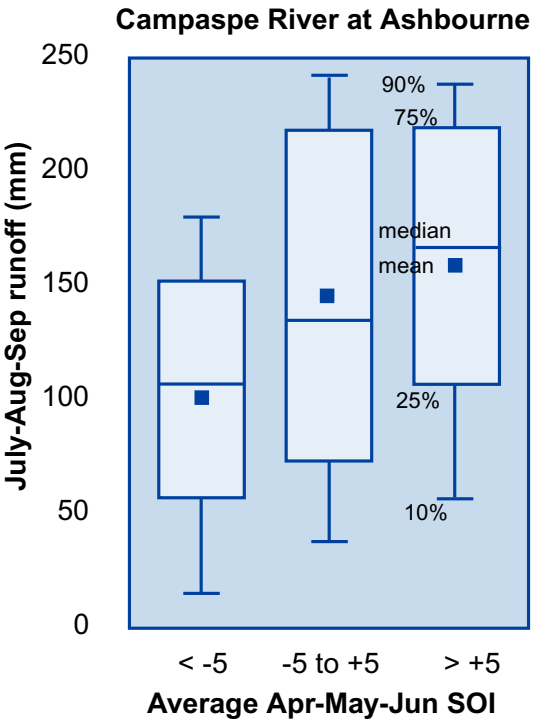
CVAP projects have contributed to policy development through research results covering exceptional circumstances and taxation impacts on resource sustainability. Results from a CVAP project (jointly-funded with GRDC and RIRDC) on using seasonal forecasts in the northern grains region are being applied by farmers in opportunity-cropping systems to increase profitability and sustainability.

There is a continued increased demand for communication products, as evidenced by the now more than 800 registered readers for the Program newsletter CLIMAG.

The recently completed RAINMAN streamflow project will be a valuable tool in water resources management. The graphs show how the Southern Oscillation Index (SOI) influences runoff in the following three months at Gleneagle (North Queensland) and Ashbourne(Victoria). The graphs show percentiles of the historic runoff distribution in relation to the SOI.

For example, if the average SOI from October to December is greater than five, there is only a 10% chance of runoff from the catchment being less than about 120mm. For SOI less than five, the chance is about 75%. Other predictors evaluated by the project included sea surface temperatures and runoff in the previous period. The preferred predictors vary by location and season.





Analysis of Performance

The management strategy for the current phase of CVAP includes annual milestones. As shown by the mid-term review, these are being met. At the project level, the majority of projects will be completed by mid-2001. All projects are on schedule to achieve their planned outputs as demonstrated by milestone reports which are on at least an annual basis.

Communication

The Program has been highly successful in developing a range of communication activities in response to the high priority previously identified. As part of the communication plan for the Program, the CLIMAG newsletter, a WebSite <www.cvap.gov.au>, and project FACTSHEETS were further promoted. The priority audience includes researchers and advisers in agriculture and natural resource management.

As part of the LWRRDC Climate Variability Occasional Paper publication series, two major reviews were published during the year: *Agriculture Climate Research and Services in Australia* (CV02/99); and *Climate Variability and drought research in relation to Australian agriculture* (CV01/99).

Future directions

Projects at or near completion are providing a range of products of value in managing climate-related risks. The major task is to achieve national coverage across a wide range of industries and regions. This is more readily achieved where there are agencies with advisory or educational programs including climate risk management.

Two projects have been funded recently to further promote products from the SILO project to ensure wider industry coverage and to provide more localised information tailored to individual user requirements. The final year of the current phase will feature a review and national conference to highlight achievements of CVAP.

The review will cover longer-term opportunities to develop applications in industries and regions which are currently making only limited use of their potential to better manage climate risk. The review will also include options for maintaining the current rate of progress in improving seasonal forecast skill. The rate is dependent on collaboration between researchers in agriculture and natural resource management and researchers in climate and ocean science.

National Dryland Salinity Program

Goal and strategies

The National Dryland Salinity Program (NDSP) is a leading natural resources management initiative jointly sponsored by Australia's leading rural industries, the Commonwealth Government and State Governments. It was initially established in 1993 to improve coordination of the national R&D effort to assist in dealing with this increasingly important challenge.

The first five-year phase was completed in 1997–98. A second phase, built largely on the results and emerging trends from the first, is due

for completion in 2003. While biophysical research continues as a major element, this second phase includes important research into the social, institutional and policy implications of the salinity threat.

Dryland salinity is increasingly recognised as a natural resource management challenge of major proportions in Australia and one that is not confined to the rural sector. There is better understanding of the extent of threat to rural and urban infrastructure (roads, railways, bridges, buildings, pipelines and gardens) native vegetation, wetlands and the flora and fauna that make up the habitat of these areas. Streams and rivers are vulnerable to salinity and increasing decline in water quality has serious implications for both regional and urban communities.

It has been known for some years that more than 2.5 M ha of land are affected by salinity, with the likelihood that this could increase to around 15 M ha. Release of the work undertaken by the National Land and Water Resources Audit later in 2000 will assist in consolidating these estimates. The Audit, with its management orientation is also providing a rigorous framework for salinity control. The first part of this was the definition of groundwater flow areas for Australia and therefore the context for defining management interventions. Australia wide mapping of the areas affected by dryland salinity and projected to be affected out to 2050 has complimented this. Work is now underway to define the effectiveness and appropriateness of various management activities within the differing groundwater flow areas of Australia, leading to an integrated assessment of management opportunities for salinity control by mid 2000–2001.

Project work on updated annual costs to Australia will also be available within the next 12 months, including a much better idea of the costs to local government and householders. Information from four years ago indicates annual costs of $130 M in lost agricultural production, $100 M in damage to urban and rural infrastructure and at least $40 M in loss of environmental assets.

The second phase of the NDSP is based on a goal of research, development and extension of practical approaches to manage effectively dryland salinity across Australia. Strategic investment of funds is concentrating on:

- causes, costs and consequences;
- institutional arrangements;
- management of saline resources; and
- landscape ecosystems and processes.

Risks and specific opportunities

The salinity problem in Australia is now known to be of such a scale as to cause loss of hundreds of millions of dollars in both the domestic and international economy. Assessment updating the extent of the threat is well advanced. It is likely that at least four Australian states will have ‘whole of government’ strategies in place in the next 12 months to provide policy frameworks for action.

An R&D program based on partnerships between the levels of government and industry provides the opportunity for collaboration and consistency and the potential for planning for nationally-driven natural resource management policies. Salinity is likely to be a major driver of those policy settings. Results from projects funded by the NDSP can feed into both the State level strategies and national NRM policy frameworks. These will include options for productive use of lands affected by salinity and new industry opportunities.

Collaborating organisations

- LWRRDC (lead agency)
- MDBC (funding partner)
- GRDC (funding partner)
- RIRDC (funding partner)
- National Land and Water Resources Audit (funding partner)
- AFFA (funded from the National Landcare Program)
- CSIRO (research partner)
- State Governments of New South Wales, Queensland, Victoria, Western Australia and South Australia (management partners)

The Management Board is continuing to explore opportunities to expand the partnership to include other governments, industry R&D corporations and national community based groups. It is also communicating with Cooperative Research Centres (CRCs) involved in a range of industries and activities where salinity is, or is likely to be, a problem.

Achievements and outcomes

The Program has continued to engage politicians and senior government officials through strategically targeted meetings and involvement in CSIRO science briefings on the salinity threat in WA and SA. It was represented at the community salinity summit for NSW held in Wagga Wagga early this year, followed by the NSW government organised summit in Dubbo several weeks later.

A national workshop has been held focusing on the emerging findings of four large projects, investigating options which include:

- productive use of salinity;
- use of engineering techniques for salinity management;
- the role of local government in contributing to salinity management; and
- the institutional changes needed across Australia to allow application of effective policies for managing salinity.

The Boards of LWRRDC and GRDC have continued their financial commitment to the Program of $5 M each over five years into NDSP II, which commenced in 1998–99. Further investments have been made by RIRDC and the National Land and Water Resources Audit and AFFA, bringing the total amount invested to around $16 M.

Eleven R&D projects were contracted in 1998–99, covering the following subjects.

1. Enhancing institutional support for management of dryland salinity.
2. Assessment of options for productive use of saline lands.
3. Assessment of the efficacy of engineering techniques for the management of dryland salinity.
4. Local Government capacity to manage dryland salinity.
5. Watertable change in cropping areas of Western Slopes – NSW.
6. A simple device for determining deep drainage.
7. Catchment water balance and land use impacts.
8. Tools to investigate and plan for improved management of dryland salinity.
9. Catchment classification of salinity management.
10. Extent and impacts of dryland salinity nationally.
11. Determining the costs of dryland salinity across the Murray-Darling Basin.

A further 13 projects have been contracted in 1999–2000.

1. Delineation of potential salinity hazard in Queensland cropping lands.
2. Regional case studies to assess water balance & management options.
3. Salinity management & optimisation framework.
4. Developing a national monitoring framework for dryland salinity.
5. Appraisal of infrastructure assets under threat.
6. Structural adjustment in agriculture & capacity to implement catchment plans.
7. PROGRAZE Update.
8. Beyond 2025: transition to a biomass alcohol economy using ethanol and methanol.
9. Focus catchment review.
10. Predicting the combined environmental impact of catchment management regimes on dryland salinity.
11. Assessment of a system to predict the loss of aquatic biodiversity from changes in salinity.
12. Biogeochemical and physical processes in saline soils and potential reversibility.
13. Generation and delivery of salt and water to streams on a catchment scale.

When complementary projects, ie. those wholly funded by one of the funding partners, are added to these 24 projects, then the total research portfolio under the Program comprises 40 projects. In addition, another five projects are being developed for NDSP Board consideration.

Analysis of performance

The NDSP is well advanced in meeting key performance criteria, though more effort is needed to gain better balance of projects across the Program's management objectives and themes. The contracting of four projects within the Landscape Processes objective has

helped to redress this balance. While the portfolio of projects appears not to give enough emphasis to management of saline resources, many of the complementary projects wholly funded by GRDC are within this area.

The Board will have the opportunity to develop Phase II further over the next financial year, having approved a mid-term review of the Program to take place before the end of 2000.

Phase II of the NDSP continues to progress well with planning in line with the goals, objectives, strategies and activities for funding, encapsulated within the Program Management Plan. This Plan has been disseminated to stakeholders affected by dryland salinity throughout Australia.

Communication

The Management Board has reinforced its commitment to continuing investment in communication activities. The concept of State communication coordinators in the partner States is being retained as an essential element in improving local and regional knowledge about the Program. The method of funding is being changed with the agreement of the partner states, whereby the annual cost per coordinator is to be equally shared and slightly increased to give each coordinator an operating budget.

It is important that any revised communication coordination arrangements in partner states are such as to allow the coordinator to operate across and with agencies on a whole of government basis. The NDSP Board also accepts that arrangements to apply must suit the needs of the respective jurisdictions.

The Program newsletter *Focus* continues as a source of information, with issues being published quarterly. A survey of readers was conducted this year to seek views of the readership on improving content. The opportunity was taken to revise the design of the newsletter. The changes have been well received by the readership.

The contribution of funds from the National Landcare Program to support the communication activities of the NDSP was most timely. It is hoped that a similar contribution will occur for the remaining years of the Program.

Future directions

The increasing interest of the partner States in the salinity threat, and the salinity strategy planning which has begun in least three States (WA has already released its second such strategy), will help the NDSP Board in identifying issues and priorities for investigation over the remainder of the Program. This activity combined with the mid-term review, due for completion by Christmas 2000, will be most informative for planning and strategic positioning of the Program for its remaining two to three years.

These activities will help to meet the concerns of the Management Board referred to in last year's report about the current inadequacy of present policy, institutional and regulatory frameworks at the three levels of government to tackle seriously the issue of dryland salinity.

The NDSP Board is also heartened by the initiative being taken by the State and Commonwealth Governments in exploring the concept of an intergovernmental agreement on natural resource management. Salinity and water quality are the major thrusts for this suggested agreement and may provide the opportunity for the NDSP Board to structure Program activity to take advantage of any finalised agreement.

This outcome would be strong justification for investment in the range of research undertaken over the five years of NDSP Phase II.

For further NDSP information, please consult LWRRDC <www.ndsp.gov.au>.

North Australia Program of R&D (NAP)

Goals and strategies

The North Australian beef industry occupies the majority of land across Queensland, the Northern Territory and the Kimberley and Pilbara regions of Western Australia. The 12.8 M cattle in the North account for about half of Australia's beef herd, almost half of Australia's national beef production and more than half of all beef exports.

The North Australia Program of R&D (NAP) has been in place since 1986. It began with a strong emphasis on increasing productivity and profitability in the industry. However, in recent years, increased emphasis has also been placed on sustainable use of the pastures and the diversity of landscapes that support them. This shift in emphasis was greatly assisted through co-funding of $0.5 M per year, provided by LWRRDC, to complement MLA's Program funding of $2.5 M per year.

The R&D emphasis within the current phase of the Program has been to develop grazing management systems to maintain or improve native pastures. Increasingly, the Program is working with beef producers to integrate ecological sustainability with economic and social aspects of the beef production enterprises it serves.

The overall goals of the Improving Resource Management sub-program within the current phase of the NAP is to improve the development and adoption of ecologically sustainable resource management systems and their profitable use by the Northern Australian beef industry.

As the Program enters its final year, increasing emphasis is being placed on ensuring that the outcomes of R&D projects are available in formats which encourage producers to integrate them into their whole property management.

In working to achieve this goal, this sub-program is seeking to:

- apply and further develop ecological sustainability principles for grazing systems in the major agri-ecological regions across Northern Australia;
- examine the relationships, on a regional or landscape basis, between livestock production and ecological sustainability, which is broadly defined to include maintenance of regional populations of plants and animals, as well as maintaining the condition and productivity of land and water resources;

- support research to develop effective linkages between knowledge and decision-making processes; and
- ensure the integration of sustainable management strategies into profitable whole property management systems.

Risks and specific opportunities

Seasonal variability of climatic conditions across Northern Australia, and the impacts of highly unstable commodity prices on the capacity of beef producers to undertake major change in their production systems are two of the greatest threats to R&D within the NAP.

However, each of these is also an ongoing feature of beef production in Northern Australia, and as such offers an opportunity to design R&D projects which address real on-property production situations. Increasingly, throughout the life of the NAP, the R&D focus has moved from research plot work to paddock and whole property and landscape scales, with a stronger involvement of beef producers in the development of research projects.

Changing investment priorities within MLA, as a producer-owned and managed company operating in a market-driven climate, could also see a shift of funds from resource management. However this is considered unlikely, given existing commitments to place greater emphasis on environment and sustainable management issues in a climate of growing expectations of consumer and the wider community.

Collaborating organisations

- MLA (lead agency)
- LWRRDC (major funding partner)
- Environment Australia (EA – funding partner)

Since 1996, LWRRDC has been a major contributor to the Improving Resource Management sub-program and EA has also become a financial partner in some specific projects. A collaborative approach by funding agencies with different key interests has enabled the research program to cover a breadth of resource sustainability issues less feasible for the NAP operating alone on behalf of the beef industry. A Resource Management Panel, comprising representatives from the three funding organisations, together with representatives from Landcare, the Australian Conservation Foundation and individual beef producers, provides advice to the Program.

Funding within the NAP is also contingent upon R&D providers each making a significant contribution in either funding or related in-kind activities, such that CSIRO, various State government agencies and universities are also collaborators within the Program. Recently, collaboration with the North Australian Beef Research Council has also been strengthened.

Achievements and outcomes

Specific resource management issues included in the NAP include:

- continuation of projects on the long-term effects of different grazing pressure and management strategies

(eg. fire) on pasture composition, tree/grass balance and weed management;

- relationships between grazing, grazing management and maintaining key aspects of ecosystem function, including both water and nutrient movement and the conservation of biodiversity; and
- integration of grazing and resource management practices into efficient and profitable whole property management systems.

Numerous major research sites, supported by results from a larger number of minor sites, exist across Northern Australia. NAP funding also supports other projects in cattle management and nutrition, property management and efficiency, which provide strategies to reduce grazing pressure and provide on-farm resources to devote to resource management issues. Increasingly, over the life of NAP, emphasis has shifted towards integration of sustainable resource management with other aspects of on-property production. Both the producer-led Beef Plan project, and a recently established Grazing Land Management project, are directed to building awareness and skills across the industry in sustaining healthy landscapes with profitable cattle production.

The NAP has facilitated and funded several workshops, coordination meetings and producer demonstration sites and has assisted in creating a rewarding and dynamic relationship between producers, agribusiness, extension and research workers. As part of an action learning process, producers are being provided with greater opportunities for direct involvement in R&D projects. Several of these have resulted in publications within the NAP Occasional Paper series, targeted primarily to the R&D community, while others have resulted in more practical publications targeted primarily to beef producers.

As the final year of the NAP begins, strong emphasis is being placed on delivery of outcomes of funded projects in formats readily accessible to producers.

Analysis of performance

Since the commencement of Phase 3 of NAP in 1996, strong emphasis has been placed both on scientific peer review and on ensuring relevance of the R&D to the beef producers, who are both co-funders and clients of the Program. Detailed peer reviews, involving project team members and external reviewers (both scientific and producer), have been conducted annually for all projects in the resource management sub-program. A major peer review workshop will take place during the latter part of 2000, to assess:

- progress of projects against agreed goals;
- the achievement of the resource management sub-program against its goals and objectives; and
- the effectiveness of projects and the program communication strategies in the field.

The major new project in Grazing Land Management initiated during the past year was also developed through an

extensive, structured stakeholder/ customer needs analysis.

Communication

The primary focus of the NAP is in individual R&D projects, each of which is required to develop and implement its own communication strategy. The NAP has also sponsored various workshops on elements of sustainability in northern beef production, each of which brings together technical expertise from within the R&D community and northern beef producers.

Sub-program 3 of the NAP, which is directed to Improving Whole Property Management, serves as a vehicle to encourage uptake of the outcomes of the resource management R&D conducted within sub-program 2. This is complemented through sponsorship of occasional field days and other events, and ongoing producer demonstration sites.

The NAP also publishes a regular newsletter, *NAP News*, and a series of Occasional Papers resulting from annual peer review workshops and the outcomes of various R&D projects. The Program is also contributing to MLA's *Tips & Tools* series prepared for landowners and managers. As part of the process of ensuring effective delivery of R&D outcomes from the Program, NAP has developed, in collaboration with Land Insights (a Sydney-based communication consultancy), a comprehensive communication manual for use by staff and other people associated with the Program

Future directions

As the current phase of the NAP is nearing completion, most of the projects to be undertaken by June 2001 are at a well-advanced stage. It is anticipated that strong emphasis will be placed on whole property and landscape-scale work. This will better achieve improved natural resource sustainability through improved grazing and other management strategies. These strategies aim to reduce and reverse the impacts of land and water degradation on beef producers, and to meet the expectations of the wider community for the land and water management practices adopted by the beef industry.

The NAP is currently engaged in a major customer-focused needs analysis, which will guide the nature of MLA investment in resource management R&D in the North beyond 30 June 2001.

For further SGS information, please consult Meat and Livestock Australia <www.mla.com.au>.

Redesigning Agriculture for Australian Landscapes R&D Program (RAAL)

Goals and strategies

The mission of this Program is:

To design novel agricultural systems which ensure economic production and ecosystem and landscape function, by matching these systems to the unique biophysical characteristics of the Australian environment.

This R&D Program was initiated in 1996 as a first, but significant, step to

design new agricultural systems for Australia. The RAAL R&D Program is researching how agricultural systems in Australia can be redesigned to address a range of sustainability issues. The initial focus of the RAAL R&D Program is on water and nutrient leakage. However, a range of sustainability criteria will be considered in developing redesign options, including protection of biodiversity.

The Program arose from increasing evidence that most current agricultural production systems in Australia are not likely to be ecologically sustainable in the long-term. In particular, current crop and pasture plants, and production systems, are not able to make full use of available rainfall and soil moisture; consequently, they leak water and also nutrients.

This contrasts to the native systems that have been displaced which were able to use a much greater proportion of available rainfall. It is this additional water leaking from agricultural systems that is largely responsible for moving salt and nutrients around the landscape, giving rise to dryland salinity, soil acidification and nutrient exports to lakes and rivers.

There is a clear need to develop new agricultural systems that match the unique characteristics of the Australian landscape. These new systems must focus on addressing the underlying cause of the major forms of degradation, and seek to 'mimic' the functions of the Australian landscape.

Four objectives have been developed for the RAAL R&D Program.

1. Understand, by comparison, the key biophysical processes affecting leakage of water and nutrients in cropping, grazing and natural systems.
2. Benchmark criteria for redesigning agricultural systems in Australian landscapes.
3. Develop a toolbox of redesign options to modify current, or develop new, agricultural systems for Australian landscapes.
4. Facilitate implementation of redesign options in priority Australian landscapes by exploring the socioeconomic, institutional, policy, marketing and technological requirements and implications of each option.

Risks and specific opportunities

This Program carries an element of risk due to the inherent complexity involved in designing new agricultural systems that mimic natural systems, and the aspirational nature of the potential opportunities to be achieved by the Program. The Program is strategic in nature, and there are many uncertainties and challenges ahead. However, the Program has instigated a balanced portfolio of R&D, and has forged links with a range of stakeholders, to ensure these risks are minimised.

An ongoing risk is to influence the much larger effort in agricultural research with the outcomes of the Program, specifically those addressing sustainability issues. The science behind these outcomes is strong, and is beginning to influence the agricultural

community. In addition, the Program is seeking the active participation of people from other research and rural industry organisations.

Collaborating organisations

- LWRRDC (co-lead agency)
- CSIRO (co-lead agency)

Achievements and outcomes

Major field studies are underway near Wagga Wagga in Southern New South Wales and at Moora and Kalannie in Western Australia. A third site, on the wet tropical coast, is due to be established shortly. At each site, work is comparing the ability of native and agricultural systems to use water and nitrogen.

The field studies are beginning to identify the key functionalities involved in each system, and comparisons are indicating broad principles necessary to redesign agricultural systems. In addition to the field data collection, the Program includes a modelling project that enables the field data (as well as data from other work) to be modelled for particular agricultural environments.

Based on Agricultural Production Simulation (APSIM), the model is exploring the broad redesign principles for a range of landscapes using long-time series of climatic data. It is assessing the extent to which agronomic modification can improve the sustainability of existing crop and pasture systems.

The Program has scoped the opportunities to breed, select and bioengineer plant species to control deep drainage and nitrogen leakage. Using the functions and characteristics identified in the field studies and tested using the model, scientists involved in plant improvement were invited to develop a brief paper scoping the various opportunities in terms of cereals, oilseeds, grain legumes, pasture and fodder plants, other new crops and pasture species.

This project has highlighted that the breeding, selection and bioengineering of crops and pastures can contribute to ameliorating dryland salinity and acidification. This contribution is likely to be over and above current agronomic and other management improvements.

In addition, the scoping study has identified many opportunities that can be implemented in the short term. In particular, current breeding programs for a range of annual crops and pastures (eg. cereals, oilseeds, grain legumes, other legumes) could, through relatively minor refocusing, achieve a range of beneficial outcomes.

A Phase 2 Program Strategy 2000–2002 outlines the directions and projects necessary to deliver principles, options and processes to redesign agricultural systems for Australian landscapes, along with a strategy and investment prospectus for a third phase of the Program.

Particular attention has been given to ensuring the Program has strong links with other R&D activities, and is able to contribute effectively to those activities.

Analysis of performance

Results from the Program's R&D in progress continue to provide a solid foundation for the redesign of agricultural systems. Field studies and modelling activities have addressed project objectives and are delivering outputs, many of which are being picked up in other R&D and related activities. The 2000 Annual Coordination meeting, involving key stakeholders and participants, favourably reviewed the Program's progress and provided constructive feedback for the second phase.

A significant increase has been observed in the Program's profile at a range of policy, research and industry levels. The Program is beginning to have an impact. This profile is supported by increasing results, through the field studies and modelling activities, indicating the opportunities and challenges involved in undertaking this redesign.

A range of complementary activities continues to be undertaken by CSIRO Land and Water.

Communication

The Program has been discussed with a range of stakeholders and publicised extensively in a range of media. Communication activities have focused on presenting the Program's rationale, projects and progress as a means of engendering interest and support.

Feature articles on *Farming systems for salinity control* have been published in *Focus* and the *Australian Grain Yearbook*. A draft Communication Strategy has been prepared for the second phase of the Program.

The 2000 Annual Coordination Meeting involved a range of stakeholders, including several new to the Program. The outcomes of this meeting provided a solid foundation for Phase 2 of the Program.

Future directions

The second phase of the Program will run from 2000 to 2002 with the support of LWRRDC and CSIRO. Phase 2 will use the outputs and design principles developed in Phase 1 to scope the concepts, criteria and broad options necessary to redesign agricultural systems against a range of sustainability criteria. It will undertake a rapid appraisal of redesign options in priority landscapes.

Phase 2 will scope the plant breeding opportunities and the innovative farming systems being developed by farmers. Eight key projects will be supported in Phase 2 as part of an integrated portfolio which not only aims to expand the redesign tools and principles, but also to involve key research, policy, industry and community stakeholders in discussions around the concepts for landscape redesign.

The outcome of Phase 2 of the Program will be principles, options and processes to redesign agricultural systems for Australian landscapes, along with a strategy and investment prospectus for Phase 3 of the Program.

For further RAAL information, please consult <www.lwrrdc.gov.au>.

R&D for Environmental Management of Military Lands Program

Goal and strategies

The Program aims to implement a practical and cost-effective environmental management plan for the Townsville Field Training Area (TFTA); and to develop a broader management framework for army training areas in tropical savannas, based on the principles of ecologically sustainable development.

As an agency of the Commonwealth Government, the Defence Department is committed to maintaining the environmental values of Defence Department properties, while achieving their primary objective of providing high-quality, effective training to maintain defence force readiness. The integration of these two objectives represents a substantial challenge for an organisation that traditionally has not focused on land management.

The strategic approach in this Program was therefore to ensure that land management decisions are proactive rather than reactive, with equal emphasis on planning and monitoring. The Program focus included gathering information on activities at TFTA, organising the information into a flexible, accessible format and integrating information into the decision-making process of land managers and training officers.

Risks and specific opportunities

The Program was essentially completed during the year, except for the production of a manual and delivery of a workshop on environmental management. Both of these tasks will be completed during August 2000.

Collaborating organisations

- LWRRDC (joint funding agency)
- Department of Defence (joint funding agency)

Achievements and outcomes

1. Determining how livestock grazing and military training activities affect long-term sustainability of tropical savanna ecosystems

This was the major experimental work of the Program and the final report was presented during the year. It was found that military training activities are unlikely to be a major cause of poor water quality or impaired biological function in streams on TFTA. Recommendations for managing TFTA include:

- grazing be discontinued on TFTA;
- rotating training areas for tracked vehicle use to allow resting and recovery;
- regularly monitoring erosion and establishment of exotic weeds on small-scale intensive training areas;
- maintaining minimum groundcover levels and restricting the use of high erosion risk areas; and
- using a combination of satellite imagery, videography and ground-based monitoring to measure condition and trend in important resource variables.

2. Constructing decision support tools to evaluate management alternatives; and training military land managers to use decision-making tools

The EDYS (Ecological Dynamics Simulation) model was evaluated for use at TFTA. Developed by a group of United States scientists for assessing the impacts of grazing, fire and military training on vegetation and animal dynamics at scales of a few metres up to thousands of hectares, the model was revised to better simulate Australian conditions, using parameters set for a hillside at TFTA. EDYS is able to simulate savanna performance but because it is a complex model it requires parameters for which data are not readily available in Australia. Considerable effort and expertise would be required for it to be used widely in Northern Australia.

The original Program proposal envisaged developing a GIS-based DSS tailored to the resource information and management needs of TFTA. Since then, the Department of Defence has adopted Nobility-EM, a GIS-based decision support application for environmental impact management. This meant there was little point in building another GIS-based DSS as it would duplicate many of the functions of Nobility.

It was decided that the best use would be made of the information by incorporating the experimental data into GIS resource data layers; preparing an environmental management manual; and providing a workshop on application of ecological concepts and learnings from the research Program. It was originally planned that the manual be written and the workshop provided in May 2000. However, unexpected training activities at TFTA during May-June caused necessary personnel to be unavailable. The workshop will be held in August 2000.

The Program outputs are now coming together and will provide the managers and users at TFTA with tools for better planning of training activities to minimise adverse impacts. In addition, the overall management of the TFTA environments can be further improved to ensure their continued suitability for military training.

Analysis of performance

Apart from the production of the final version of the manual and delivery of the workshop all projects have been completed.

Communication

Communications activities in this Program concentrate on the major users (the military planners and range managers within the Army) but attention is also given to other stakeholders included in the Communications Plan. This involves continuing interactions (including both formal meetings and individual contacts) with stakeholders to ensure the tools are suitable, and to provide the users with an understanding of the capacities and limitations of the tools. The manual and workshop will be important activities for bringing the various aspects of the Program together.

A paper describing activities in the Program was presented at the

International Rangeland Congress in July 1999 to expose the studies to a broader audience.

Future directions

After the delivery of the manual and workshop in August 2000 the Program will be complete. Future directions will depend on further discussions between the Department of Defence, LWRRDC and CSIRO.

For further Program information, please consult <www.lwrrdc.gov.au>.

Social and Institutional Research Program (SIRP)

Goals and strategies

LWRRDC established this Program in September 1999. It is about innovation in the social, economic, commercial, legal, policy and institutional dimensions of natural resource management (NRM).

By definition, NRM is about people's management of land, water and vegetative resources. The Corporation understands, after a decade of funding NRM, that achieving continuous improvement in natural resource management requires better understanding of how people manage natural resources through the institutions and instruments that they create.

The Program seeks to inform the Australian community and specific organisations, groups and people involved in NRM with:

- new management ideas and options for policy-makers in government, industry and the community;
- better ways for information from different sources to be integrated so that decision-makers have the best available information in a useable form to deal with NRM issues;
- improved processes for the adoption of research into practice;
- new ways of designing and doing research which brings in the various disciplines and participants in a useful way; and
- the means to build the skills and the community capacity for this research to be done in future.

Program strategies implemented during the year include the following.

- Consolidation of Australian and international knowledge on the social and institutional drivers and impediments to improved NRM.
- Assisting the understanding of social and institutional factors that determine NRM behaviour across all levels.
- Support for analyses of the social and institutional drivers and impediments to improved NRM at all levels.
- Assessment of alternative institutional arrangements in NRM (eg. regulation, market mechanisms, self-regulation, community-based programs, joint ventures and partnership arrangements).
- Development of policy and program options in NRM for government, industry and community organisations.

- Support for analyses of NRM law and the improvement of NRM regulation.
- Funding for, and leadership in, R&D on options for improved community participation in NRM.
- Provision of the ways and means for information from different disciplines to be integrated and made available in useable form for NRM decision-makers.
- Development of recognition of the Program to generate increased awareness, understanding and participation.
- Development of relationships with key people, groups and organisations that will contribute to the Program's goal and strategies.
- Communication of knowledge of NRM social and institutional factors to research funders, providers and users.
- Communication, specifically to government, industry and community policy groups, on options for social and institutional innovation.
- Development of improved research methodologies, techniques and skills in the social sciences and humanities relating to NRM research.
- Promotion of, and support for, NRM research activities that integrate the information and approaches of the various disciplines.
- Promotion and support of research activities which meet the needs of users of R&D results and which involve them in the design, conduct and review of projects.
- Facilitated coordination of social and institutional research across all the LWRRDC-managed R&D Programs.

Risks and specific opportunities

There remains a considerable gap in understanding the social, economic, commercial, legal, policy and institutional factors that drive or impede improvements in NRM. This is the gap in understanding which the Corporation has identified as often being the most potent constraint to more sustainable use of Australia's natural resources. It has meant that good quality biophysical research and apparently logical policies have low rates of adoption and successful outcomes.

The Corporation implemented this Program to provide a new focus and major effort to overcome these concerns and to ensure that continual improvement is made to the way natural resources are managed. This involves:

- building critical mass in community awareness of the key issues and support or ownership of solutions;
- undertaking R&D and analysis which offers integrated and commercially and socially feasible solutions;
- developing NRM practices that take account of environmental, economic, commercial, cultural, aesthetic, health and heritage values;
- developing social and institutional arrangements and processes for scientific and technological

advancement, which are more complementary to the processes of natural systems;

- reforming old institutional frameworks and building new ones which provide the right operational climate and incentives for action to be commercially driven;
- communicating information in useable forms and which outline the practical steps for natural resource managers to take; and
- establishing commercial and community-based arrangements for follow-up advice and support.

Collaborating organisations

Australia's financial and human resources for social science and humanities research in NRM is limited and building critical mass in R&D skills and capacity requires a highly collaborative approach amongst organisations which have similar goals.

The Program aims to add value to social and institutional research in natural resource management by building on the expertise and existing knowledge of other organisations.

In its first year, the Program initiated consultations with a wide range of organisations to build this collaborative approach and to deliver more effective research results. These include:

- Agriculture, Fisheries and Forestry – Australia:
  - Natural Resources Management Policy Division,
  - Social Sciences Centre, Bureau of Rural Sciences,
  - Australian Bureau of Agriculture and Resource Economics;
- Murray-Darling Basin Commission;
- Australian Research Council;
- Rural Industries R&D Corporation;
- Environment Institute of Australia;
- Foundation for Rural and Regional Renewal;
- Australian Academy of Social Sciences; and
- Humanities Academy of Australia.

Efforts will be made in the coming year to link the efforts of these organisations and to encourage collaboration and funding partnerships in R&D.

Achievements and outcomes

A study tour of research and policy institutions in Europe was conducted to investigate latest developments in natural resource management R&D and the adoption of social and institutional research outputs. A report of the Study Tour is available on the Program WebSite at <www.sirp.gov.au> and the report's recommendations have been incorporated into the Program where possible. Contacts established through the Study Tour will be maintained through links on the WebSite and these people will be invited to participate in discussion forums and research where appropriate.

Results from the following eight Program projects, which completed their Final Reports by 30 June, will be communicated to specific government, industry and community target audiences during the coming year:

- building the knowledge base of the social and institutional dimensions of NRM;
- enhancing the knowledge base on community participation in NRM;
- developing conceptual frameworks for analysing effective policy relationships in NRM;
- developing conceptual frameworks for analysing effective NRM policies and programs;
- developing methodology for analysis of NRM law and regulation;
- reviews of current NRM decision support and assessment techniques;
- developing guidelines for integrating disciplines in NRM R&D; and
- developing guidelines for participation of R&D users in research.

A number of continuing projects from the former Program, Integration and Adoption of R&D at the Catchment Scale, were incorporated into the Program. The projects were:

- development of an integrated catchment management software package;
- farm decision making and resource use under new corporate structures and contractual arrangements; and
- integration of research and development in catchment management.

Products from two completed projects (an integrated information management system for catchment managers, and evaluation of integrated catchment management in a wet tropical catchment) were communicated to State and Commonwealth government agencies and catchment management groups during the year through publications, workshops and WebSites.

General Call projects incorporated into the Program during the year were:

- citizens' juries for environmental management;
- processes and institutional arrangements for resource and environmental management;
- decision-points for land and water futures;
- The Insight Model for alternative land and water policy alternatives;
- ecological and social functions influencing governance of natural resources; and
- sustainability with profitability through rural adjustment via water markets.

Postgraduate scholarships supported during the year included:

- a review of environmental science (from independent experts to post-modern process managers); and
- the effectiveness of integration of water and land use planning.

Analysis of performance

Competition for new projects was very high, with high quality submissions being received. Eight new research projects were commissioned with the general aim of consolidating a knowledge base and methodologies for future social and institutional research.

These projects were commissioned through open tender which attracted 90 proposals from throughout Australia.

Fourteen milestone and ten final reports were submitted by projects. All met contract achievement criteria and budgets. There were only four extensions of time granted for milestone and final reports, and one project was cancelled.

During the coming year, assessments will be made of the impact of completed projects and awareness of the Program amongst government, industry and community audiences.

Communication

The Program has established a WebSite <www.sirp.gov.au> that will be a major communication platform in future.

All new projects are required to integrate communication into their activities and to provide advice on a communication strategy for their outputs. Significant funding is provided each year to ensure that these are communicated effectively to users.

Major effort will be made in 2000–2001 to communicate the results of projects that were completed during the year through guidelines, handbooks, policy briefs, occasional papers and research reports. Emphasis will be placed on personal briefings where appropriate.

Future directions

The Program will commission a range of R&D projects that build on the results of its first year. New projects will include:

- the implementation of an Australian social sciences and humanities knowledge base on NRM arising out of previous projects;
- an international review of the key drivers of major social and institutional change which distils the implications for social and institutional reform in the Australian NRM context;
- an assessment of options for institutional reform of land tenure, land management, property rights and related arrangements;
- an assessment of ecosystem goods and services in the Goulburn-Broken Catchment and the implications for Australian NRM;
- creation of a contemporary common property resource management institution;
- evaluation of producer-led R&D management and adoption using relevant Corporation projects as case studies; and
- exploration of the transferability of successful organisational models across NRM.

The Program will also fund two new postgraduate scholarships: the social and institutional implications of landscape and landuse change, and integrating cross-jurisdictional planning for sustainable regions.

Major emphasis will be placed on the review and coordination of social and institutional research across Corporation-managed R&D programs and the communication of results of completed projects.

For further SIRP information, please consult <www.sirp.gov.au>.

Sustainable Management of Rivers and Water Resources

National Eutrophication Management Program (NEMP)

Goals and strategies

The mission of the National Eutrophication Management Program (NEMP) is to undertake the research and communication activities necessary to reduce the frequency and intensity of harmful or undesirable algal blooms in Australian fresh and estuarine waters.

The principal strategies for achieving this have been to identify key R&D gaps and fund R&D on both generic topics and via four focus catchments: Wilson Inlet (WA), Fitzroy (Qld), Namoi (NSW) and Goulburn-Broken (Vic). An emphasis on communication is met through project, catchment and program communication plans.

Risks and specific opportunities

Management of eutrophication is inter-linked with other environmental management issues. For example, controlling the size and frequency of river flows has been shown to be an effective algal management tool as well as a necessary management technique for general river health. This provides an opportunity to develop management strategies that simultaneously assist with the management of algae as well as other terrestrial and aquatic issues. This opportunity is being followed up through a proposed R&D program into River Contaminants.

The Program Coordinator is also a manager within one of the R&D providers for eutrophication research and this constitutes a risk to corporate governance. The Program Management Committee is always notified of topics where there is a potential conflict of interest and the Program Coordinator does not participate in these discussions.

Collaborating organisations

- LWRRDC (lead agency)
- MDBC (funding partner)

R&D is carried out in close collaboration with a number of research providers (CSIRO, CRCs, universities) and management agencies.

Achievements and outcomes

The following were the major research achievements from NEMP projects during the year.

- Irrespective of the timing of the opening of the bar separating Wilson Inlet in WA from the ocean, there is a regular, predictable pattern of saline inflows, anoxia in the bottom waters of the Inlet and pulses of nutrients being released from sediments. This regularity is unusual in an ecological system. The importance of controlling the timing and duration of connections between estuaries and the ocean has been demonstrated through the Wilson Inlet findings.
- The Wilson Inlet acts as an efficient trap for nutrients carried down from the surrounding catchments. A large percentage of the nitrogen escapes to the atmosphere from the Inlet, but the phosphorus appears to build up in the sediments.

- The introduction of predatory, native fish into reservoirs shows promise as an ecological method for controlling cyanobacteria. Once this biomanipulation technique is confirmed, it will provide managers of large water storages with a new way for reducing closures because of algal blooms.
- Research in the Namoi catchment using radio-isotopic tracers has confirmed that very little of the dissolved phosphorus in the river comes from fertilisers. Most comes from the erosion of stream banks and from upland gullies. Land management will also contribute to algal management.
- A consultancy into the cost of algal blooms to the Australian economy put the figure at $180 M to $240 M a year. This was a conservative figure that did not include the costs arising from estuarine blooms. Many managers who need to understand the seriousness of the issue have sought this report.
- A specialist workshop into the role of nitrogen in fuelling algal blooms, concluded that nitrogen was likely to be as important as phosphorus in this respect, and that we need to increase our understanding of the nitrogen cycle in order to provide managers with techniques for controlling nitrogen.

The following research support activities were completed during the year.

- The Program sponsored an expert panel, consisting of scientists, land managers and Departmental officers, which translated R&D findings in the Liverpool Plains region into practical farm-level advice.
- Two Community Workshops were run (Melbourne and Shepparton) that allowed landowners and other managers to question scientists directly about the implications of their R&D findings for local problems. Both were strongly attended and two more are planned for 2000–2001.
- A compendium of data and information about the catchment of the Wilson Inlet was published and released.

It was clear from the response of the regional nutrient managers that they now accept that much of the phosphorus in rivers comes from diffuse sources, including gully erosion in much of the Murray-Darling Basin. This change in understanding has been brought about, in part, by NEMP-funded research and communication activities.

Analysis of performance

During the year, the NEMP management committee met five times to oversee progress. Six NEMP projects were completed. Three consultancies were completed.

The Program assessed 20 milestone reports.

The independent review of NEMP noted the very high quality of the research and the good progress towards adoption. This was achieved through close interactions maintained with resource managers and an effective communication plan. The

review recommended that further funds be invested into turning the new knowledge generated into practice. This recommendation has been taken up in the development of the new River Contaminants Program that will follow after NEMP.

Communication

The NEMP Coordinator gave presentations of the latest findings from eutrophication research to the national conference of agricultural consultants. These consultants are often the first line of contact with many landowners and so form an important link between research outputs and research adoption. Other research outputs were presented to general audiences via regular articles in the LWRRDC-published *Rivers for the Future* magazine and the *Innovate Australia* magazine (published by the joint R&D corporations). Presentations were made to regional workshops in Wilson Inlet, Tamworth and Shepparton.

R&D progress reports are linked to the NEMP WebSite <www.nemp.aus.net>, providing browsers with access to the overall Program as well as to details on the individual R&D projects within the Program.

The proceedings from the *Limiting Factors* workshop and the Cost of Algal Blooms consultancy were published, along with a brochure describing the latter report.

The annual meeting of NEMP researchers and collaborators was held in Tamworth in November 1999 and focused on project outcomes and future R&D needs. The 2000–2001 communication workplan is designed to transmit these messages.

Future directions

The Program was externally reviewed during the year and was judged to have undertaken excellent science and to have met the needs of regional managers. A consultancy into future R&D needs for river contaminants has been undertaken and provisionally accepted by the Board of LWRRDC and the Murray-Darling Basin Commission Riverine Issues Working Group.

The proposed R&D program will include salinity, nutrients, sediments and, possibly, pesticides and will be conducted using a whole-of-ecosystem approach. The program will concentrate on turning existing knowledge into practical solutions in topics where there has been a rapid increase in our understanding over the last few years. It is proposed to study two ecosystems – one within the Murray-Darling Basin and a coastal one. The program will work closely with the National Rivers Consortium, which incorporates Riparian Lands R&D.

For further NEMP information, please consult <www.nemp.aus.net>.

National Groundwater R&D Program

Goals and strategies

The mission of this Program is to provide management and policy information and tools to assist in the sustainable use of groundwater resources and the protection of groundwater quality. The Program

strategy has involved a national review of R&D needs followed by prioritisation by a management committee comprising experts from the key State managing agencies. Other strategies include undertaking collaborative R&D with partners, commissioning R&D in priority areas of supply failure, incorporating appropriate communication/transfer pathways in each project and maintaining a watching brief on groundwater policy and management developments.

Risks and specific opportunities

The principal risk with groundwater is always 'out of sight – out of mind'. The Program needs therefore to continually raise the awareness of groundwater issues in the minds of managers and policy makers. Opportunities are increasingly arising to incorporate groundwater as part of the whole water cycle from allocation to management to protection. Better tools, information and awareness are needed to achieve this. Raising the understanding and management capability for groundwater managers in rural areas is a key challenge.

Collaborating organisations

- LWRRDC (lead agency)
- NSW Department of Land and Water Conservation
- Western Australian Water and Rivers Commission
- Queensland Department of Natural Resources
- National Groundwater Management Committee under the Standing Committee on Agriculture and Resource Management (SCARM)

Achievements and outcomes

The Program was reviewed by independent consultants in late 1999. The review was complimentary in describing the Program's performance "…LWRRDC has raised the profile of groundwater R&D with the inception of the National Groundwater R&D Program. All researchers and management agencies believe that LWRRDC has the national focus and the organisational structure to continue to enhance applied research in the groundwater area."

One of the year's highlights was the holding of a workshop in May 2000 where the issue of groundwater/ecosystem interaction was addressed. It provided a forum for information exchange between groundwater researchers and those involved in policy development. Several new linkages and an enhanced understanding of groundwater issues resulted.

The workshop showed that much had been achieved, since the report was commissioned by LWRRDC two years ago, in terms of:

- greatly enhanced awareness of the issue, with several States now developing policy in this area;
- completion of an important study on the Perth coastal plain, which has led to changed management practices by WA management agencies; and
- significant progress in ongoing groundwater/ecosystem research in

Queensland, NSW, South Australia and Victoria.

The workshop was a follow-up to the report by Hatton and Evans (LWRRDC Occasional Paper 12/98 *Dependence of Ecosystems on Groundwater and its Significance to Australia*, which sells for $20 from the AFFA Shopfront (freecall 1-800-020 157). Outcomes from the workshop will be published as a LWRRDC special publication.

The Management Committee noted very satisfactory progress with the fractured rock project, especially at the Clare and Atherton sites. The work at Atherton in feeding into the Water Allocation and Management Plan process. At Clare, new insights have been gained as to how water and chemicals move in these complex and important systems.

Key outcomes achieved this year include:

- the development of possible management strategies to minimise the possible adverse environmental impacts of groundwater use;
- improved strategies for management of fractured rock aquifers in terms of resource evaluation and transport of dissolved materials; and
- training of groundwater professional in the management of fractured rock systems.

Analysis of performance

The external review of the Program has shown that its performance has been good in terms of innovation and leading edge R&D that is increasingly influencing groundwater management.

Communication

Due to the relatively small size of this Program, a formal program-level communications strategy has not been developed and communication activities are undertaken on a project by project basis. This has proven highly effective, with good outcomes attained from briefing tours, promotion of reports and use of the national groundwater school and conferences.

Future directions

The five-year Program is now in its final year. All remaining projects will be completed during 2000–2001. The Program has attracted potential new funding partners. It is planned to consider the establishment of a new, enhanced Program during the coming year.

For further Program information, please consult <www.lwrrdc.gov.au>.

National Program for Irrigation Research and Development (NPIRD)

Goals and strategies

NPIRD has operated since 1993. It was established as a partnership between LWRRDC and the irrigation industry to address issues related to the sustainability of irrigated agriculture.

Between 1993 and 1996, the Program followed priorities identified in a study commissioned by the National Irrigation Research Fund. The next NPIRD phase to 2000 was established following consultation with stake-holders and clients. The total invest-ment over the first two phases of the Program has been more than $7.78 M,

with Phase 2 (1997–2000) investing more than $5.33 M (including $2.16 M in 1999–2000).

The irrigation industry has undergone significant physical, financial and cultural changes since 1996. As a result, the Phase 3 Program Plan addresses a range of new priorities to emerge from the extensive process of stakeholder consultation. A further $4.2 M in partnership funding has been negotiated in NPIRD Phase 3, with the following goals.

- Establish a national generic Water Use Efficiency (WUE) framework for irrigation that can be applied to the wide range of irrigation systems and environments. This will involve clarifying the terms, measurements needed, and methods of interpreting and reporting data.
- Improve understanding of how irrigation activities interrelate with wider catchment processes. The aim is to minimise environmental impacts, raise awareness on unforeseen risks and enhance irrigation and catchment sustainability.
- Gain a better understanding of the benefits, costs and strategic implications of the restructuring of water provision services; separation of water from land rights; water trading; and environmental flow allocations.
- Promote national uptake of participative R&D processes, improve industry networks and enhance the R&D base for irrigation.
- Consolidate national benchmarking of irrigation systems and scope the potential linkages with on-farm performance monitoring.

Risks and specific opportunities

The third phase of NPIRD provided opportunities of running a truly national program for irrigation, improving networking and gaining improved adoption of R&D outputs. The substantial industry consultation and representation focused the R&D effort on real needs and issues. In contrast, a significant risk is too little investment in strategic R&D as identified in the Program review.

Collaborating organisations

- LWRRDC
- NSW Land and Water Conservation
- NSW Irrigators Council
- QLD Department of Natural Resources
- Goulburn-Murray Water
- Wimmera-Mallee Water
- Southern Rural Water
- Sunraysia Rural Water
- WA Water and Rivers Commission
- WA Agriculture
- Ord Irrigation
- South West Irrigation

Achievements and outcomes

The Australian Water Provider Benchmarking report, initiated by NPIRD, was the first such report by any country in the world. The International Commission on Irrigation

and Drainage has acclaimed the report, which was funded by the COAG Task Force, AFFA and NPIRD, as a model that could be used by all member nations.

The report documents the performance of 46 irrigation water supply systems around Australia. It provides a framework to measure their performance in system operation; environmental issues; business processes and financial administration. In future, the benchmarking process will be funded and managed by the irrigation industry, through the Australian National Committee on Irrigation and Drainage (ANCID).

NPIRD Phase 3 commenced with advertised calls for projects in an attempt to capture the diversity of issues. The first and second advertised calls were particularly successful in addressing most of the NPIRD priority issues. In addition to the suite of approved projects, the NPIRD Management Committee had identified some remaining strategic issues that required investment in Phase 3.

Considerable work has since taken place to develop these concepts into projects, including the establishment of appropriate networks and linkages between research providers, agencies and industry. This is a particularly slow process but one that has generated considerable benefits even before the projects themselves generate information. In a way, the development of projects in this manner is a version of the Participative Action Management model that NPIRD developed under Phase 2.

The latter stages of Phase 3 investment will continue to focus on the development of projects based on identified strategic issues. In particular, the Program will seek to achieve the following.

- Harmonisation of storage management to address the sometimes competing demands of variability (for the environment) and reliability (for industry).
- National consistency in our approach to measurement and reporting of crop water balance and evapotranspiration.
- Initiation of a scoping exercise into the feasibility of a National On-Farm Benchmarking Scheme – to be completed in 2000–2001. This scoping will develop the conceptual framework and identify resource requirements.
- Development of a national framework for the assessment of irrigation developments, consolidating a previous investment by NPIRD in this area.

The last year has involved an intense schedule of activities, due to the ongoing maintenance of Phase 2 activities; the initiatives commissioned from Phase 2 funds; and the significant planning effort for Phase 3. The Program Coordinator attended a number of project steering committee meetings and workshops throughout the year. In addition, more effort was made to liaise with research providers outside of the scheduled project reviews.

The process of project selection has been significantly strengthened with the establishment of a Technical Reference Group. This group provides technical advice and project ratings to the NPIRD Management Committee during the project selection process.

An important part of management objectives for 1999–2000 was to improve the follow-up activities at the conclusion of projects. The new information strategy essentially provides such a strategic framework for addressing this issue in a consistent and logical manner.

NPIRD has an increasingly important role working with the two peak industry bodies, ANCID and the IAA, in the scoping and delivery of National Workshops and conferences on core issues. This relationship works particularly well, since NPIRD brings the research credibility and resources whilst the industry partners bring networks and essential industry backing.

Examples over the last year include:

- IAA conference Melbourne – research stream presentations and stands;
- ANCID conference – presentations and stands;
- National subsurface drainage workshop (CLW20);
- National Workshop on Nutrients and Sediments in Irrigation Drainage (GMW7); and
- ANCID Channel Seepage workshop (WRW1).

Analysis of performance

The Program review, covering 5.5 years of R&D investment, reached quite favourable conclusions regarding the Program performance. Some areas for improvement were identified and were addressed, including:

- wider representation and national profile;
- increased strategic R&D;
- stronger linkages with other R&D corporations; and
- improved program evaluation strategy, including use of program-level performance criteria.

Communication

The Program has acted as a catalyst for more integrated irrigation R&D effort in Australia. A number of Phase 3 NPIRD projects focus on improved communication between regions and institutions. In addition, NPIRD and the MDBC Irrigation Program have reciprocal membership to ensure that maximum benefits are obtained from limited resources.

A significant amount of work has gone into redesigning the Program's communication effort in response to a comprehensive communication audit of NPIRD, and in line with the proposed restructure of LWRRDC operations. The new NPIRD communication package, to be implemented in 2000–2001, includes the following key elements:

- enhancement of the NPIRD WebSite <www.npird.gov.au> functionality;
- revised information recording and distribution strategy;

- a business planning approach to the marketing of reports and project outcomes;
- continued development of information packages, to be titled the *NPIRD Irrigation Insights Series*;
- more structured communication guidelines and assistance for project managers; and
- coordinated communication with other LWRRDC programs through agreed service contracts.

The NPIRD Management Committee aims to meet in two regional locations each year in addition to the regular phone conferences.

This year the Committee toured the Northern Victorian irrigation region, including both formal and informal interaction with researchers and landholders. Two other face-to-face meetings were held in Canberra to:

- finalise investment decisions for the Phase 3; and
- liaise with LWRRDC in relation to the proposed restructure of Corporation operations.

There are a significant number of requests for information about the Program and the projects under management. Most queries of a general nature are handled via email and phone, although with the development of the NPIRD web page the Program now has a more efficient way of directing people to the information they require.

The expanded Partnership agreement for Phase 3 was finalised, with financial agreements in place to 2002. The continued institutional restructure of NSW water management, together with the introduction of the Goods and Services Tax, has required reconsideration of the levy collection mechanisms for NSW irrigators.

Interim arrangements will be in place for the 2000–2001 collection whilst negotiations continue on the most appropriate and equitable means for NSW contributions in the longer term.

Future directions

With Phase 3 investment almost complete, the Program will now focus on the following areas:

- finalisation of remaining investment decisions on priority issues currently being scoped;
- ensuring that contracted projects deliver against agreed outcomes;
- ensuring that the NPIRD communication package is implemented according to the revised strategy and priorities;
- ensuring that NPIRD makes a significant contribution to the new LWRRDC strategic plan and corporate structure; and
- investigation and agreement on a revised Program and project evaluation methodology.

Strategically, by the end of this financial year, the Program is aiming to position itself for a renewed round of negotiations with current and prospective partners for a fourth phase of activities. It is expected that the review, planning and negotiation phase will take place throughout the final year of Phase 3.

For further NPIRD information, please consult <www.npird.gov.au>.

National Rivers Consortium

Goals and strategies

The National Rivers Consortium's vision is to achieve continuous improvement in the health of Australia's rivers. The Consortium is a strategic collaboration between policy makers, river managers and scientists.

The Consortium is established under a Board of Management comprising LWRRDC, the Murray-Darling Basin Commission (MDBC), CSIRO Land and Water, and the WA Water and Rivers Commission. The Board will expand as additional partners join the Consortium.

The Consortium has the following priorities:

- protecting rivers with retained natural values;
- restoring degraded rivers;
- training river managers;
- turning research into practical river management solutions; and
- undertaking regional catchment projects.

Risks and specific opportunities

The major risk to progress is ensuring effective collaboration with key R&D providers, National and State agencies and Catchment Authorities, to support this national initiative.

While there is currently a high level of individual activity on specific issues, there is no effective framework at the national level for assembling the best available information and knowledge on Australia's rivers, and for delivering ongoing improvements in their long-term management.

The Consortium needs to secure sufficient resources to undertake an effective program of activities and the benefits of national collaboration have to outweigh the transaction costs if the initiative is to be successful. Making an impact on the continuing degradation of our rivers requires substantial financial resources and a coordinated and focused national effort.

Collaborating organisations

- LWRRDC (managing agency)
- CSIRO Land and Water (funding partner)
- MDBC (funding partner)
- WA Water and Rivers Commission (funding partner)

Achievements and outcomes

Activities and achievements completed include the following.

- National Rivers Consortium Strategic Plan and Prospectus for new members.
- National review of the legislative and regulatory basis for river management activities.
- Development of a framework and planning process for river restoration and rehabilitation practice.
- Development and promotion of best practice river restoration, rehabilitation and management techniques.

- Development of methods for identifying and protecting rivers of high ecological value.
- Report and design of a program of activities for information exchange and capacity building.
- Development of a program of training and knowledge exchange activities to increase the capacity and skills of river managers.
- Design of one or more regional or catchment based best practice research/demonstration projects.
- Planning for a workshop on the management of inland river systems.

While the Consortium has not been established for long enough to report significant outcomes, it has focused attention on the need for an improved national effort on managing Australia's rivers. The Consortium also implements the new direction proposed by the LWRRDC Strategic Plan 2001–2006, with a team-based approach and River Landscapes being one of the four arenas of LWRRDC research activity.

Analysis of performance

The Consortium has taken time to gain the breadth of partner support to fully launch itself. In 2000, the partners decided not to wait any longer and initiated the Consortium to concentrate on achieving valuable and influential successes, as a foundation for future growth.

The Consortium has limited resources but skilled staff to deliver useful and readily applied outputs. There has been a significant increase in support for the Consortium and growing confidence that it can meet the needs of river managers. In particular, catchment and river management authorities are becoming strong supporters of the Consortium.

Communication

Communication for this Program is integrated with the new LWRRDC communication plan. A service agreement specifies the respective roles and responsibilities for undertaking communication activities by the Consortium and by LWRRDC.

Future directions

The National Rivers Consortium will better assemble the full range of skills, expertise and capacity of major organisations involved in river restoration and protection in Australia. The Consortium will connect the various types of activities (policy, science, practical management) and speed up progress to achieve community goals for river condition and management.

For further NRC information, please consult <www.rivers.gov.au>.

National River Health Program (NRHP)

Goals and strategies

The overall goals of the Program remained unchanged during 1999–2000, to:

- provide integrated physical, chemical and biological tools to assess and monitor the health of Australian rivers; and
- develop an understanding and methodologies for implementing the

environmental flow requirements of rivers and their floodplains.

During the year, the Program has focused on maximising the outcomes from the Phase 1 NRHP investment.

Risks and specific opportunities

Prolonged drought has affected two projects, including the large Campaspe environmental flows project. Legal issues surrounding the future management, development and support for the AUSRIVAS technology were partially addressed during the year.

Collaborating Organisations

- EA– Biodiversity and Environment Protection Groups, Water Policy Section (funding partner)
- LWRRDC (management partner – to 30 June 2001)
- Water Services Association of Australia (managing the Urban sub-program)
- MDBC (managing Environmental Flows Decision Support Program)

Achievements and outcomes

The Monitoring River Health Initiative (MRHI) maintained its continued primary focus on supporting the development of riverine bioassessment. It continued to support the final stages of two of the original 19 bioassessment R&D projects, with one of those projects being completed during the year.

In addition, two of the three microbial bioassessment projects initiated during 1998–99 were supported and one was completed. Two of the three postgraduate scholarships on freshwater macroinvertebrate taxonomy were ongoing in 1999–2000.

Two new projects were initiated under the AUSRIVAS aspect of the MRHI and completed within the year. One project completed the development of the AUSRIVAS models, and the other assisted with production of a stream diatom key (or iconograph).

Key outcomes of the MRHI in 1999–2000 were:

- initiation of the final ('alpha') stage of AUSRIVAS model development (which was then continued with funding from Environment Australia);
- completion of the first national key to diatoms and book on river monitoring and experimental methods (due to be published by Cambridge University Press late in 2000); and
- ongoing support for postgraduate research in macroinvertebrate taxonomy.

The Environmental Flows Management Initiative (EFMI) continued to support the three remaining environmental flows R&D projects from the original 16 in its portfolio. One of these was completed during the year, with the production of a guide to estimate water requirements for floodplain wetland plants.

The Campaspe project, jointly funded by the CRC for Freshwater Ecology (CRCFE), continued its final year of field work, with LWRRDC funding. The CRCFE has agreed to continue the project, despite drought conditions and the resulting absence of releases from

Lake Eppalock. An additional experimental project – on riverine and floodplain interactions under high flow – will continue beyond June 2000. This has also been affected by the absence of high flow events.

The Environmental Flow Decision Support System project was completed. A national workshop was run on its usage.

The Program Coordinator is continuing much of the initiatives developed from the LWRRDC-managed NRHP (Phase 1) under the EA-managed AUSRIVAS component of the NRHP, now funded through the NHT (Phase 2). There is strong continuity both in Program direction and Program coordination. Much of the legacy and products form the LWRRDC-managed MRHI is being actively used in Phase 2.

Analysis of performance

The performance of the Program has been sound, with the final program outputs being well promoted and feeding into Phase 2 where appropriate. The termination of the co-management relationship between LWRRDC and EA was fully acknowledged early in the financial year and built into the LWRRDC's management of the Program.

Communication

Communication activities have been restricted to articles in the LWRRDC-published *Rivers for the Future* magazine, and occasional articles and television coverage associated with the FNARH managed by the lead agencies. Communication activities are now largely the responsibility of EA.

Future Directions

Phase 2 of the NRHP is now being managed by EA, without LWRRDC involvement. Phase 1 projects will continue to be managed by LWRRDC until the completion of all project contracts (projected to mid-2001).

For further NRHP information, please consult <www.lwrrdc.gov.au>.

National Wetlands R&D Program

Goals and strategies

The Program goal is to support the conservation, rehabilitation, restoration and long-term sustainable development of wetlands by government and private sectors in Australia, through targeted R&D. The strategy is based on the outcomes of a national R&D priorities review and involves funding projects against seven key areas: water regime; contamination; grazing and cropping practices; invasive pests; health monitoring; valuing wetlands; and information/technology transfer.

Risks and specific opportunities

The risks to the continued sustainability of Australian wetlands are many and varied. The Program is attempting to minimise some of these risks by providing for more effective management.

Collaborating organisations

- EA (lead agency)
- LWRRDC (managing partner)

Achievements and outcomes

Eleven projects were initially funded under the Program, of which six are now complete.

- Margaret Brock: How do water regime and grazing alter the reproductive capacity of aquatic plants? (University of New England)
- Jim Puckridge: Modelling ecological responses to water regimes in arid wetlands. (University of Adelaide)
- Jenny Davis: Monitoring wetland health: are National River Health Program protocols applicable? (Murdoch University)
- Alistair Robertson: The availability of wetland habitat for waterbirds in arid Australia. (Charles Sturt University)
- Anthony Milne: Identifying and monitoring change in wetland inundation patterns, Kakadu NT. (University of NSW)
- S. Chamala: Integrating wetlands R&D and onground wetland management scoping study.

The remaining five projects are all scheduled to be completed by the end of 2000:

- (Scheduled for completion: July 2000) Richard Kingsford: Changing water regimes and wetland habitats in the Lowbidgee floodplain. (NSW National Parks and Wildlife Service)
- (August 2000) Michael Douglas: Weed management and the biodiversity and ecological process of tropical wetlands. (Northern Territory University)
- (September 2000) Martin Thoms: The effect of flow on nutrients in wetland habitat. (University of Canberra)
- (December 2000) Paul Bailey & Paul Boon: Implication of nutrient enrichment for management of primary productivity in wetlands. (Monash University & Victoria University)
- (December 2000) Jeff Bennett: The private and social values of wetlands. (University of NSW)

Analysis of performance

The Program has recently been reviewed by Resource Policy and Management Pty Ltd. The recommendations of the review will be considered by the Program Management Committee.

Communication

While the public and private sectors are now generally more aware of the values of and threats to Australian wetlands, and there is increased interest by community groups in onground wetlands management; the extent to which this Program has contributed to these changes has not been precisely determined. However, it seems likely that the Program has contributed, even in some small part, to the groundswell of increased environmental concern about wetlands now evident within the wider Australian community.

For example, LWRRDC coordinated the publication of the second in a series of wetland publications stemming from research by Margaret Brock at the University of New England. Both publications – *Are there plants in your wetland? Revegetating wetlands* and the previously-published *Are there seeds in your wetland? Assessing wetland*

vegetation – are available free of charge from the AFFA Shopfront on freecall 1-800-020157.

After all project payments and administrative costs are paid out of the remaining R&D funds, there will be a small residue (estimated $20,000). These unspent funds will be put towards communicating outcomes of the Program and its projects.

Future directions

The Program formally completed its three-year funding period at 30 June 1999. A Program review report, completed in 1999–2000, will be considered in August 2000 by the Program Management Committee, which will make recommendations to the Minister for Environment and Heritage on the future of the Program.

For further Program information, please consult <www.environment.gov.au/bg/environm/wetlands/r_d/rd.htm>.

Riparian Lands R&D Program

From 1 July 2000, this Program will be managed as a science-based program component under the broad umbrella of the National Rivers Consortium. During 1999–2000, it was managed as a stand-alone activity, and it is therefore reported separately here.

Goals and strategies

To develop guidelines and practices for sound and economic management of riparian lands, in order to maintain and improve the condition and value of streams, wetlands and impoundments.

This Program has three major components.

- A **physico-chemical research** component has the objective to identify and quantify the effects of riparian lands on channel morphology, bank stability and entry of nutrients and sediments to rivers and waterbodies.
- An **ecological research** component has the objective to identify the key processes by which riparian lands influence in-stream ecosystems and their functioning and to quantify the major effects.
- A **demonstration and evaluation** component has the objective to demonstrate practical, cost-effective and ecologically-sound methods for rehabilitation and management of riparian lands.

The Program operates through a series of research and demonstration/evaluation sites around Australia, established through collaboration with State agencies, catchment management committees, local government and landcare/rivercare groups.

The two research components aim to understand and quantify crucial processes in the interactions between riparian lands and adjacent waterbodies, and to draw out principles for sound management of riparian lands. The demonstration and evaluation component aims to test these principles in practical settings, through involvement by landholders and local community groups.

Communication activities disseminate information from throughout the Program through a range of products designed to meet the needs of different audiences and end-users.

Risks and specific opportunities

Community awareness and expectations in sound management of rivers and their adjacent riparian lands is increasing. This has helped to develop an expanded market for Program outputs and products.

There has been a high demand for products designed for both technical audiences (eg. government agency personnel, catchment management and landcare facilitators), and those products aimed more broadly at the community and individual landholders.

Program outputs have been made available as principles for sound riparian management, together with practical advice on how these may be implemented.

It is up to individual groups and landholders to work out how best to meet these principles in their particular circumstance. Some of the demonstration/evaluation projects have shown significant economic benefits in the long-term from improved riparian management. This is an important factor in reducing the risk of low adoption rates.

Collaborating organisations

- LWRRDC (co-lead agency)
- CRC for Catchment Hydrology (co-lead agency)
- Centre for Catchment and In-Stream Research – Griffith University (co-lead agency)
- State agencies (funding partners)
  - Queensland Department of Natural Resources
  - NSW Land and Water Conservation
  - SA Department of Environment, Heritage and Aboriginal Affairs
  - Hydroelectric Commission, Tasmania
  - Agriculture Western Australia, and WA Water and Rivers Commission

Achievements and outcomes

The first phase of this Program was completed at 30 June 2000. The two research components have been highly successful at identifying and quantifying critical processes that govern interactions between riparian lands and their vegetation and aquatic systems.

For example, it has been shown that a well-maintained grass buffer strip of six metres width can be very effective in trapping up to 95% of sediment and associated nutrients from upslope intensive agriculture.

The important effect of tree roots in reinforcing and stabilising stream banks has been quantified for different parts of a river's catchment. Work has shown the relative importance of hill slopes and gullies/channels as sources of sediments under particular catchment and land use conditions.

This data has been collated in the form of sound management principles and decision-support tools. For instance, as look-up tables showing the influence of tree roots in stabilising banks in relation to distance and depth, or the width of grass buffers needed for particular slopes and land uses.

The ecological research has demonstrated that inputs of material (leaves, twigs, flowers, fruit and bark) from streamside vegetation are a critical component of aquatic food chains for streams in natural condition in Australia. It has been shown that nitrogen rather than phosphorus can be the nutrient limiting in-stream algal growth within forested streams.

Of special importance, work has shown that the shading effect of riparian vegetation is critical in preventing the growth of nuisance plants and algae in streams, even in the presence of enhanced nutrient levels.

This has been a common finding right across Australia, with results also showing the influence of latitude and stream orientation. At lower latitudes in the tropics, shade equivalent to approximately 70% of that found under natural conditions is required to prevent the growth of nuisance plants and algae, while a level nearer 60% is sufficient at higher latitudes to the south.

Much of the shading effect of vegetation can be obtained by revegetating just the northern bank on east-west flowing streams of up to several metres width. This is important information for catchment or rivercare groups with limited funds. The information from this ecological research has also been collated in the form of management principles and decision-support tools.

The demonstration/evaluation projects have enabled landholders and community groups to test and evaluate different methods of riparian management and rehabilitation. A number of cost:benefit analyses have been completed. This work has led to a large expansion of interest and involvement in riparian management in the catchments concerned. However, information and awareness has been slower to move to adjacent catchments. The results of these projects are at present being collated and will be published as a set of national case studies to provide support and guidance to the many other groups who wish to undertake riparian projects.

Much of the work undertaken in the first phase of the Program has been published in a detailed set of *Riparian Land Management Technical Guidelines,* that summarise known information from published literature. This is presented in the form of a set of practical methods for on-ground riparian management. Demand for this report, as for other Program products, has been high. It provides an essential source document of information not previously available within Australia.

The Program newsletter *RIPRAP* and other Program outputs have continued with similar high levels of demand.

An independent review of the Program and its impact was conducted towards the end of 1999. This was undertaken by the Virtual Consulting Group, with assistance of two external scientific reviewers, Dr J. Imhof of the Ontario Ministry of Natural Resources, and Dr R. Davies-Colley of the New Zealand National Institute of Water and Atmospheric Research. The review concluded that:

- the Program had significantly raised the profile of riparian land management within Australia;
- the scientific research was of exceptionally high quality, and had developed a sound basis for future management;
- communication activities had been very successful at collating information and making it available in readily-useable forms for different target audiences; and
- overall, the Program had represented an excellent return for the funding available.

The review noted a number of opportunities for work to build on and enhance that completed under the first phase. It also recommended that in any further work, a closer connection be established between the physico-chemical and ecological research components.

Analysis of performance

The first phase of the Program has now been completed. It has clearly been very influential in raising the profile and capability for riparian land management within Australia. The close working relationships established by Program research teams and State agency personnel, as well as with many community groups, has helped to ensure a high level of interest in, and uptake of, Program findings and outputs. An independent review of the Program identified the significant progress made in process understanding and development of sound principles for riparian management. The challenge now is two-fold:

- to help further extend the level of awareness amongst the Australian community of the importance of riparian lands and the need for improved management; and
- to ensure that Program findings are used to maximum effect to support onground management, including that supported under the Natural Heritage Trust.

Communication

An innovative and dynamic communication approach developed by the Program has led to increased demand for its products and interest in its activities. A River Landscapes Poster, promoting the message of working together to restore Australia's river and riparian environments, has been widely sought. Similarly, the poster's companion brochure outlining the work of the Program and how its research activities and products can assist groups and individuals to better manage these special environments has been in demand.

The Rivers WebSite <www.rivers.gov.au>, combined with the release of the *Riparian Land Management Technical Guidelines* and the *Rehabilitation Manual for Australian Streams,* has been an important part of Program communication. Printed copies of these materials have also been made widely available to people who want to use them as a ready-reference source.

Other products arising from the Program, including its newsletter,

RIPRAP, as well as further technical reports and decision-support tools, have achieved a high level of penetration amongst potential user audiences.

Future directions

Following completion of the independent review of the first phase of the Program, a plan for a second, five-year phase was developed. This identified 12 key areas for improved riparian management, for which additional research and demonstration activities were required.

This plan was discussed in detail with State agencies, catchment committees and other community groups with an interest in riparian management. There was universal support for a second phase of the Program, which is now being established in collaboration with the range of partners that were involved in Phase 1.

The recommendations of the Program review are being followed in establishing the second phase, particularly the need for closer integration between research disciplines. A national advertisement identified three major groups who wished to be involved in the second phase and to make available significant resources of their own. Research will be contracted with other groups where particular skills are required.

Agreement in-principle has now been reached between LWRRDC and a range of partner organisations to commence a second phase of this Program from 1 July 2000. Negotiations on research priorities in relation to the identified riparian land management issues, and joint funding arrangements, are continuing. The aim is to begin commissioning and contracting research towards the end of 2000.

For further Riparian information, please consult <www.rivers.gov.au>.

Sustaining Vegetation in the Landscape

Joint Venture Agroforestry R&D Program (JVAP)

Goals and strategies

The vision is for a dynamic Australian agroforestry sector that is:

- economically viable through its contribution to the sustainable production of agricultural and forest products;
- managed to sustain land, water and biodiversity resources; and
- designed to enhance landscapes valued by landholders and communities at the regional and national levels.

With this vision in mind, the Joint Venture Agroforestry R&D Program (JVAP) has the goal of integrating sustainable and productive agroforestry within Australian farming systems.

To achieve this goal, the following objectives and strategies are being pursued. They have been structured to recognise the multiple benefits of farm forestry and the higher level of risk that farmers face in adopting farm forestry

compared to many other agricultural enterprises.

1. **Targeted strategies for implementation of farm forestry.** This objective seeks to underpin the removal of a range of economic, institutional and social impediments to the adoption of farm forestry.
2. **More sustainable management of natural resources** eg. soil, water, biodiversity. Strategies under this objective seek to provide and disseminate the biophysical and economic information needed to optimise the investment in trees to improve Australia's environmental amenity and natural resource base. Since some 60% of Australia's land is managed by private landholders, the integration of trees into farming systems will be crucial to achieving the level of tree planting needed to address these issues.
3. **Optimised productivity of crops and pastures**. This objective recognises that the integration of agroforestry with farming systems can provide benefits such as shelter and increased yields of crops and pasture.
4. **Optimised direct returns from tree products**. Production of commercial timber, oils and other products has the potential to provide for diversification of farm income. Uptake, however, requires improved information on commercially viable species, management systems, harvesting and processing. If the multiple objectives of farm forestry are to be achieved its geographical range needs to be extended. The development of agroforestry in medium to low rainfall areas is a key strategy.
5. **Cost effective multi-purpose agroforestry systems to meet commercial and environmental objectives**. This objective aims to bring together the research outcomes from the Program's other objectives to provide a better understanding of multi purpose agroforestry systems and to develop design guidelines and decision making tools that will assist farmers to balance commercial and environmental outcomes.
6. **Effective communication**. Effective communication is crucial to the success of the strategies in this R&D Plan. Each of the above objectives will be managed to ensure that the research outcomes are accessible to forest growers and their advisors.

Risks and specific opportunities

Agroforestry systems are increasingly being applied to areas previously considered to be marginal for traditional forestry activities, most notably medium to low rainfall areas. To optimise the potential viability of agroforestry in these areas, a key priority for the JVAP is the development of commercial species and provenances for agroforestry systems in medium to low rainfall areas.

As part of the R&D activities to assess low rainfall species, the JVAP provides support for trials to assess a range of species for hardwood and softwood production; and other products such as oil mallee. Many of the trials presently

being established may also include basic species, provenance or family collections from the wild.

Collaborating organisations

- RIRDC (lead agency)
- LWRRDC (funding partner)
- FWPRDC (funding partner)
- MDBC (funding partner)
- NHT

Achievements and outcomes

- Developed a new guideline series to communicate outcomes of key research projects. The guideline series provide more quantitative information than the previously published *Design Principles for Farm Forestry* and include state-of-the-art research results.
- Implemented the *Seed and information support for commercial farm forestry* project, which is jointly funded by the JVAP and the Commonwealth Farm Forestry Program. The project provided advice to a wide range of individuals and farm forestry groups from every state and territory.
- Published a quarterly ANU Forestry Market Report. Publication of a short report containing the first eight Market Reports.
- Published *Practical farm forestry economics: whole farm case studies* containing 10 case studies from around the country describing a range of agroforestry systems. Each case study presents an economic analysis of each system and discusses the potential social and environmental implications.
- Commissioned a study to assess the socioeconomic implications of the introduction of agroforestry systems to rural areas.
- Published a review report on the current knowledge of biophysical, and socioeconomic processes associated with agroforestry systems. This report can be used as a basis to determine methods to evaluate the effectiveness of vegetation management programs.
- Developed a series of research projects designed to investigate the impact of agroforestry and farm forestry systems on biodiversity.
- Completed a pilot study to evaluate the potential for trees to be established on non-arable land to replace weeds.
- Published a report that assesses the interaction between *E. globulus* alley systems and pasture production.
- Completed a review which identified the opportunities for growing conifers in low rainfall areas of Australia, including preliminary analysis of the potential economic and social benefits generated by these forestry systems in low rainfall areas.
- Ongoing development of physiologically based growth and yield models to make them more applicable to a wide range of agroforestry systems.
- Published a report detailing the evaluation of a novel nutrient system

for improved growth of tropical cabinet timers.

- Published a report containing new models describing the correlations between tree growth rates and site parameters. These models may be used in conjunction with economic models to undertake more sound evaluation of the potential economic returns from farm forestry activities.
- Supported the second phase of the Master Tree Growers' Program.
- Completed a guide for designing agroforestry and farm forestry systems to maximise the potential benefits to catchment health and optimise productivity.
- Developed a multi-agency project to develop a decision support tool for farm forestry.

Analysis of performance

The level of the adoption by industry of the results of research, organised and supported by the JVAP is indicated by:

- about $20,000 in sales of the 20 publications (equal to 1998–99 sales of 22 publications); and
- some 1,100 subscribers to the *Shaping the Future with Farm Forestry* newsletter.

Communication

Effective communication is a key strategy in the Program. In line with the RIRDC communication strategy, most project final reports are published or made available on the World Wide Web. In addition, where the results are considered to be of wide enough interest, 8–12 page short reports are written by science communicators to promulgate the key findings. The JVAP continued to produce the *Shaping the Future with Farm Forestry* newsletter which has a circulation of approximately 1,100. Moreover, a number of articles were published in popular media such as *Australian Farm Journal*.

Future directions

Key future developments anticipated include the following.

- Continue to develop a planning framework for the development of Biomass as an energy resource. Continue to support and manage the Biomass Taskforce and facilitate nationally-coordinated R&D into the use of agroforestry and farm forestry systems for bioenergy production.
- Continue to support R&D into medium to low rainfall agroforestry systems.
- Support and facilitate R&D to investigate the impact of farm forestry on catchment yield and water quality.
- Facilitate projects to investigate commercialisation of environmental services from agroforestry systems with an emphasis on medium to low rainfall areas.
- Commission a review of the R&D priorities for agroforestry and farm forestry systems in Northern Australia.
- Ongoing refinement of guidelines to optimise the biodiversity values of agroforestry systems. Publication of a

series of case studies detailing examples of the biodiversity values of farm forestry systems.

- Publication of a report which investigates the potential for integrated mallee processing for carbon products, eucalyptus oil and electricity
- Publication of the outcomes of a study into the socio-economic implications of the expansion of farm forestry.
- Increased availability of improved genetic material for medium to low rainfall areas of Australia.

For further JVAP information, please consult <www.rirdc.gov.au>.

Maintenance of Condition, Productive Capacity and Environmental Values of Rangelands

Goals and strategies

The aim of the National Rangelands R&D Program is to help develop methods of land use and management which maintain the condition, productive capacity and environmental values of rangelands.
In the scoping studies prior to developing this Program, the Corporation identified that the scale and diversity of Australia's rangelands meant that examination of productive use and sustainability can only be done effectively at a regional scale. There was a pressing need to link R&D with regional resource management planning processes. The key components of this Program were designed to meet these two requirements.

The three core projects include one based in the North-East Goldfields of WA, another in the Mulga Lands of western NSW, and a third based in the Central Highlands region of Queensland. In each case, local communities and agencies are involved in a regional-scale process to examine resource allocation and management practice. There is a strong interaction of that process with research teams supported by the Corporation.

The overall aim of each project is to use or provide a database of the region's natural resources, and then to examine alternative scenarios of resource use and management in order to both enhance the regional economy and improve the condition and sustainable management of those resources.

Risks and specific opportunities

The three regional planning projects are all high risk ventures, in that if the outputs are to be translated into tangible outcomes, strong political and policy support, as well as funding, will be required. At the same time, there is the potential that externally driven changes in policies and programs will overtake the R&D, which is of necessity a slower process. Each project has attempted to deal with this risk through developing links (primarily via its community structures) into policy and political frame works, and by 'institutionalising' project outputs as far as possible.

Collaborating organisations

- LWRRDC (co-lead agency)
- Commonwealth Department of Transport and Regional Services (funding partner)
- CSIRO (co-lead agency)
- State agencies (co-lead agencies)
- Agriculture WA
- NSW Land and Water Conservation
- Queensland Department of Natural Resources

Achievements and outcomes

In the WA project, the sector-based 'rules' for use of particular landscape elements have been collated to produce a set of maps of potential resource use in the region. The project is now working to establish a community executive or group that will use these maps to further negotiate and implement opportunities for changed resource use in the region.

The NSW project has identified a number of policy and related issues of institutional structures and responsibilities that reflect the views of different stakeholder groups involved in the project. Some of these opportunities have been considered and incorporated in the outcomes of the recent NSW Western Lands review.

In the Queensland project, emphasis has been placed on developing local structures to improve decision-making and management practice related to natural resources. Opportunities to 'institutionalise' community involvement and negotiation on important decisions related to sustainable natural resource management have been identified and acted upon. These have related initially to the State's impact assessment process, and through significant community involvement in responding to the Fitzroy draft Water Allocation and Management Plan.

Each of the three projects has involved close participation from stakeholder groups, both within each region and more widely (eg. State and Commonwealth agencies). Each has developed specific products for use in its region. These are being taken up by agencies and community organisations. The final reports of each project, which summarise the issues and methods used, will be made public where possible. Each project is preparing a number of written reports which should be particularly valuable for agencies and groups interested in improving natural resource management in other rangelands regions. In addition, a comparative assessment across the three projects is also being undertaken (see below).

All three of the regional resource-use planning projects are due to be completed in 2000–2001. Since they have taken different approaches to the original aim of linking research with regional planning processes, the opportunity has been taken to conduct an independent review across the three projects. The aim of this review is partly to identify whether the projects and the Program as a whole have met their objectives. More particularly, the review will also identify critical success and failure factors in the development of a knowledge-based process to guide

planning for the use and management of natural resources at a regional scale. The review commenced in June 2000 and will finish by the end of August 2000. The assessment of the three projects, and particularly their comparison of the different issues approaches and the tools and methods used and their relative success, will be published.

A fourth major project within this Program (the 'Biograze' project) has examined the potential to reduce the extended range of watering points now available within most rangeland areas. Watering points have had considerable impact on biodiversity through extending the season and range of grazing by domestic, feral and native animals. This project has developed a suite of techniques that can be used to examine alternative plans to reduce watering point distribution for their economic impacts (possible loss of grazing and animal production), and on conservation of biodiversity (benefits of reduced grazing pressure). The project has developed strong interest by a number of grazier groups and State agencies. It is likely that its methods will be implemented in a number of rangeland areas, where there is significant potential to manage better for biodiversity purposes with minimal impact on production.

Analysis of performance

This Program has pioneered a new approach to rangelands research through the close linkage between R&D and local communities and their planning processes. Projects are beginning to develop alternative resource use scenarios. It is now time to assess whether this approach is providing a significant advance on the past, in terms of practical outcomes. A number of cross-disciplinary projects have been supported jointly by the three main resource planning projects. There has been substantial sharing of expertise and experience.

Communication

As this Program comprises only four large projects, communication is mainly undertaken at a project level. Research teams have made several presentations on the regional planning projects during the year, and all were publicised at the International Rangeland Congress in July 1999. Work being undertaken to summarise results across these projects will be published to draw out principles and critical success factors for regional planning structures and processes. The early results of the Biograze project have been presented to graziers and agency staff. These will also be summarised for publication.

Future developments

This Program will be completed in 2000–2001. Once the independent review of the three regional projects has been completed, LWRRDC will be in a position to consider whether there are opportunities for further investments in rangelands R&D. This will be assessed in the context of an increasing emphasis on regionalisation for natural resource management. For example, the recent Commonwealth discussion paper on natural resource management expressed this regional emphasis.

For further Program information, please consult <www.lwrrdc.gov.au>.

Rehabilitation and Management of Remnant Vegetation

Goals and strategies

The National Remnant Vegetation R&D Program aims to assist government agencies, community groups and landholders to better manage and protect remnant vegetation through the application of improved knowledge and understanding gained from research.

The overall aim of this Program is to provide practical assistance for onground management of remnant native vegetation and also to assist the development of improved policies and programs to help achieve this aim. In undertaking this work, the focus has been on tree-dominated native vegetation in the highly-altered and fragmented landscapes of Southern Australia.

The Program has focused on three main areas: ecological research; socio-economic research; and regional planning projects. The ecological projects aim to understand the causes of continued degradation of native vegetation, and the eventual loss of species and key functions, in order to develop practical management methods to help prevent or reverse these trends.

The socio-economic projects have given special attention to the development of incentives and management structures applicable to different levels of government and non-government organisations, to assist in the sound management of remnant native vegetation. They are also examining how economic costs and benefits of managing remnants of native vegetation can be integrated with agricultural production and how social and cultural factors, as well as economic factors, affect attitudes to native vegetation.

Six State-based pilot planning projects have been funded by the Program, in association with the National Vegetation Initiative of the NHT. These projects have tested the feasibility of, and identified the major difficulties in, planning vegetation management at the regional scale. In order to maximise their impact, they have involved consortia including local communities, government agencies and researchers.

Risks and specific opportunities

Provision of sound information on the benefits of sustaining native vegetation in rural landscapes, and strong links between research, policy development and practice, help to overcome the risks associated with the Program, or at least to minimise their impacts. The highest level of risk is associated with factors largely beyond the control of the Program, such as a renewed emphasis on commodity prices and potential changes in the policy environment, overseas markets or the taxation regime. Climate change impacts are another external factor that represents both a direct and indirect risk to native vegetation. In comparison, the technical risks associated with R&D on remnant vegetation conservation and management are relatively small.

The first phase of the Program ended on 30 June 2000 and the projects have been of a high standard overall. By continuing the Program into a second

phase (see Future Directions), a specific opportunity has arisen to build on the work undertaken in the Program and to maintain the national focus it provides.

Collaborating organisations

- LWRRDC (co-lead agency)
- EA (co-lead agency)

Achievements and outcomes

The Program has achieved several notable successes, including the following.

- New insights have been gained on the contribution of remnant vegetation to biodiversity conservation in landscapes dominated by pine plantations. These have influenced plantation practice and formed the basis of a set of guidelines published early in 2000.
- A publication examining the role of the philanthropy in nature conservation and proposing tax and policy changes drew strongly on the work of Binning and Young on incentives for managing native vegetation.
- Similarly, a proposal by Binning and Young to allow a tax deduction for land valued over $5,000 that is gifted to conservation organisations has been adopted by the Commonwealth Government.
- Principles have been developed for the management of grazed landscapes in south-eastern Queensland with direct input from property owners. A series of highly successful workshops was held to discuss the approach, and a very popular board-game developed to illustrate the role of native vegetation in production landscapes.
- A number of projects in the Program have demonstrated the importance of riparian areas for biodiversity conservation.
- Work on how rural and urban residents perceive native vegetation has led to the development of guidelines to help raise awareness. The project has already done this by identifying the pressures on many younger landholders to further develop their properties, with potential negative impacts on conservation values.
- Techniques for establishing the willingness of people to pay for conservation activities on private land have been assessed and refined, and are now being adopted by State and Commonwealth agencies.
- A series of presentations across Victoria on wildlife management in Box-Ironbark forests was well attended. Management recommendations based on the research in this project have also been in very high demand. The project has also had a major influence on policy directions for the long-term conservation and management of these systems.
- The LWRRDC Board agreed to support the second phase of the Remnant Vegetation R&D Program, which is set to commence in July 2000 and will build on the successes of the first phase.

In addition, a wide range of outputs on sound management of native vegetation are being fed into other processes, for example the development of best practice guidelines by rural industries and farmer groups.

The final Program Coordination meeting was held to review progress on recently completed and ongoing projects and to strengthen linkages between projects. A number of external participants, including other LWRRDC Program Coordinators, were invited to give presentations on the links between their work and the Program and to broaden the discussion at the meeting. The meeting was very productive and served to enhance networking and communication among both researchers in the Program, and a range of other participants. It also provided feedback on activities proposed at the Program level, as well as recommendations for communication activities and the potential second phase of the Program.

Analysis of performance

An independent evaluation of the impact and effectiveness of the Program was undertaken in the second half of 1998 (and published as LWRRDC Occasional Paper 06/99, which sells for $15 from the AFFA Shopfront). This and other inputs formed the basis of the Program Plan for the second phase of the Program. This was written in the latter half of 1999 and used the work undertaken in the first phase as a platform. The draft Plan was widely circulated to a range of stakeholders and was well received. In particular, the research priorities identified in the Program Plan were widely supported. This indicates that the first phase has provided a very strong basis for further R&D on native vegetation.

Communication

While the current phase of the Program finishes in mid-2000, the benefits from its projects will continue to grow. Communication of Program and project results have been the focus of the remaining months of the Program, through the implementation of the Communication Plan. In addition, each project in the Program has its own communication pathway. With limited resources, it has been particularly important that communication at the Program level were carefully targeted. Major communication activities include the following.

- Completion of an overview of the key findings of the Program by the Program Coordinator. Ways to maximise the impact of this publication are being explored so that it reaches the widest audience possible.
- Articles on the Program appearing in newsletters, bulletins, and magazines.
- A poster presentation on the Program at the International Landcare 2000 conference.
- A symposium on remnant vegetation conservation and management at the annual meeting of the Ecological Society of Australia.
- Discussions about the Program with a range of stakeholders.

- Continuing publication of project material in the Bushcare publication series by EA.

Five new Bushcare publications associated with the Program, are available free-of-charge from EA on toll-free 1-800-803-772 or email <ciu@ea.gov.au>.

- RR 1/99 *Beyond Roads, Rates and Rubbish,* which investigates opportunities for local government to conserve native vegetation.
- RR 2/99 *Opportunity Denied*, a review of the legislative ability of local governments to conserve native vegetation.
- RR 3/99 *Conservation Hindered*, which reports on the impact of local government rates and state land taxes on the conservation of native vegetation.
- RR 4/99 *Talking to the Taxman about Nature Conservation*, a series of proposals for the introduction of tax incentives for the protection of high conservation value native vegetation.
- RR 1/00 *Landholder perceptions of remnant vegetation on private land in the Box-Ironbark region of Northern Victoria.*

In early 2000, LWRRDC took over responsibility for managing the joint publication series. The two partners in the Program agreed to reprint some of the more popular research reports in the series, and to publish a number of recently or soon to be completed projects. The following titles are already in the pipeline.

- RR 2/00 *Economics of remnant native vegetation conservation*, focusing on the market and non-market values of native vegetation on private property in North-East Victoria and the Murray catchment of NSW.
- RR 3/00 *The value of native vegetation*, a report which examines urban and rural perspectives on native vegetation.
- RR 4/00 *Managing the Bush*, which presents the key findings from the first phase of the Program.

Other planned publications will cover: the Tumut Fragmentation Experiment which examines the contribution that native vegetation makes to biodiversity conservation in pine plantations; approaches to managing native grasses in south-eastern Australia; and a synthesis of the work on incentives for managing native vegetation.

Future directions

The second phase of the Program, which is re-named *Sustaining Native Vegetation in Rural Landscapes R&D Program* will start on 1 July 2000. This will build on the successes of the first phase and continue providing a national focus on the management of native vegetation. A number of partners have given their in-principle agreement to join the Program, including all State Governments, two divisions of CSIRO and Greening Australia Ltd. Other partnerships being explored are with the MDBC and AFFA. Communication of results at both the project and Program level will be a major focus in the second phase,

which represents a very exciting development.

For further Program information, please consult <www.lwrrdc.gov.au> or <www.environment.gov.au>.

Other R&D initiatives – General Call

Goal and strategies

The majority of LWRRDC's R&D investment is through commissioned research programs. Although the commissioning process has the potential to provide substantial benefit in achieving desired outcomes, the Corporation accepts that it is also a process that locks longer-term investment into tightly defined priorities.

To ensure that the Corporation can respond to emerging issues, and to provide an opportunity for researchers to propose new or untried approaches to understanding and managing land, water or vegetation resources, a General Call is also used. Part of this General Call process includes the support of a Postgraduate Scholarship Scheme and the Travelling and Visiting Fellowship Scheme.

In 1999–2000, LWRRDC called for projects commencing 1 July 2000. The key research priorities for this General Call included:

- role of biodiversity in ecosystem health;
- soil health and landscape function;
- conservation planning for rivers and floodplains;
- systems synthesis at landscape and regional scales; and
- untested and innovative approaches to improve natural resource management in any topic within LWRRDC's charter.

Risks and specific opportunities

While the General Call elicits projects that may otherwise be overlooked in a process dominated by programs, one-off focused projects resulting from the General Call are at risk of being isolated from a broader context that would help facilitate adoption of results. For this reason, LWRRDC expects all projects, including General Call projects, to have a substantial consultation and communication component and preferably have third party support from agencies with interest in the project outcomes.

Collaborating organisations

Most General Call projects include third party support from a wide range of agencies and groups. Some, especially those testing novel concepts, are funded solely by LWRRDC.

Achievements and outcomes

Projects selected from the 1999–2000 General Call included the following.

- Improved vegetation planning for rural landscapes (CSIRO Tropical Agriculture).
- Environmental values of NSW rivers (Environmental Protection Authority, NSW).
- Environmental planning and evaluation guidelines for rivers and

floodplains (Environmental Protection Authority, Qld).

- Experimental reintroduction of large woody debris into rivers (Macquarie University).
- Creating a contemporary common property resource management institution (University of New England).
- Risk and restoration potential for remnant vegetation in salinising landscapes (Murdoch University).
- Pesticide impact rating index: validation and adoption (CSIRO Land and Water).
- Assessing ecosystem goods and services in the Goulburn-Broken Catchment (CSIRO Wildlife and Ecology).
- Soil biota: Its function in sustainable soil management (CSIRO Land and Water).

Postgraduate Scholarships awarded included the following.

- Jeanette Stanley (Australian National University) – Social and Institutional implications of landscape and landuse change.
- Samantha Capon (Griffith University) – Flow related responses of floodplain vegetation in arid, inland catchments.
- Leah Beesley (University of Western Australia) – Arid Zone ecology: The importance of floodplain connections.
- Tiffany Morrison (Queensland University) – Integrating cross-jurisdictional planning for sustainable regions.
- Heather McGuiness (University of Canberra) – Habitat heterogeneity and carbon dynamics in semi-arid floodplain river systems.

Travelling Fellowships awarded included the following.

- Stewart Whitten (Australian National University) – Private sector and non-government organisation role in natural resource management (travelling to USA).
- Sarah Ewing (University of Melbourne) – Monitoring and evaluating citizen agency interactions in adaptive management (travelling to North America).
- Andrew Bennett (Deakin University) – Relationship between landscape structure and biodiversity conservation (travelling to USA).
- David Goldney (Charles Sturt University) – Integration of conservation and production values (travelling to Europe and North America).

Visiting Fellowships awarded included:

- Professor Jan Hopmans (University of California) – Improving understanding of deep drainage between natural and agricultural systems (visiting from USA); and
- Gretchen Daley (Stanford University) – Valuation of ecosystem services (visiting from USA).

General Call projects completed in the past year have produced some diverse and exciting results. In the land area, a

decision support manual to assist farmers manage acid and acidifying soils was developed and distributed across Southern Australia. The manual was developed by the Victoria Department of Natural Resources and Environment and incorporated farmer and research knowledge accumulated across Australia under the National Soil Acidification Program.

In collaboration with RIRDC, a national project looking at harmonising the plethora of environmental management and quality assurance systems culminated in an international conference in Ballina that was well attended by Australian rural industries. The project has led to a number of industry and catchment based initiatives to explore the benefits and means of introducing environmental management systems to Australian farming practice.

In the water area, a project working closely with the Clarence River Catchment community has resulted in the establishment of an integrated floodplain management strategy that links a wide network of land and water studies. These studies are now guided under a Clarence Project Coordinating Committee and have strengthened the links between research, policy, industry practice and community participation.

Another important research outcome in the water portfolio was the development of an integrative approach to characterising the within-catchment distribution of river processes. This project will help improve water planning and remediation at the local river management level. The characterisation system was initially developed, tested and demonstrated in Southern NSW, including Bega, and has successfully received support for further validation and demonstration in Northern NSW.

Analysis of performance

LWRRDC recognises that in the case of many resource management issues, the benefits of past, good-quality biophysical research have not been realised because a lack of socio-economic understanding has led to low rates of adoption. The 1999–2000 General Call has successfully increased LWRRDC's portfolio of socio-economic R&D and this portfolio forms the basis of a new Social and Institutional Research Program. The Program covers the social, economic, policy, legal and institutional aspects of natural resource management, and is dealt elsewhere in this report.

Communication

All projects selected under the General Call have a communication component to ensure the best chance of having the research results adopted.

Future directions

The General Call will be reviewed in 2000–2001 to determine how it can be better targeted towards developing the overall research capacity in natural resource management across Australia. The Call will also be used as a means to implement any new corporate directions and priorities that may arise as a consequence of LWRRDC's next R&D Plan covering 2001–2006.

For further information, please consult <www.lwrrdc.gov.au>.

National Land and Water Resources Audit

Goals and strategies

In accordance with section 89 of the PIERD Act, LWRRDC established the Audit Advisory Council as a formal committee of the Corporation.

The Management Unit of the Audit, a Program of the Natural Heritage Trust, is co-located within the LWRRDC office. The Corporation assists the Audit Management Unit by providing administrative support. Co-location also promotes interaction between the Audit and the programs of the Corporation.

Further information on Audit activities is available in the National Land and Water Resources Audit Annual Report 1999–2000 or by viewing the Audit WebSite at <www.nlwra.gov.au>.

The goal of the Audit is to provide nationwide assessments of Australia's land, vegetation and water resources to support sustainable development. The objective for Audit activities, as specified by the Natural Heritage Ministerial Board, is to facilitate improved decision-making on land and water resource management by:

- providing a clear understanding of the status of, and changes in, the nation's land (including vegetation) and water resources and implications for their sustainable use;
- providing an interpretation of the costs and benefits (economic, environmental and social) of land and water resource change and any remedial actions;
- developing a national information system of compatible and readily accessible land and water data;
- producing national land and water (surface and groundwater) assessments as integrated components of the Audit;
- ensuring integration with, and collaboration between, other relevant initiatives; and
- providing a framework for monitoring Australia's land and water resources in an ongoing and structured way.

Risks and specific opportunities

A key characteristic of the Audit is the integrated nature of its activities across the biophysical, social and economic attributes that define natural resource management and the partnership/capacity building arrangements being undertaken with agencies of Commonwealth, State and Territory Governments. This brings with it risks.

Any integrated program of activities requires close and careful design of projects in terms of timing and data dependencies and inter-dependencies. Outputs of many Audit projects are inputs into other projects, which has resulted in a complex set of interrelationships. Working with agencies Australia wide also brings with it issues of project management – to meet milestones and deliver outputs within tight timeframes.

To minimise the risks associated with this integrated across Government program the Audit has:

- designed, documented and gained agreement for all activities through Theme Work Plans;
- specified all project outputs, treatment of errors, levels of reporting and data presentation systems through the Data Management Manual;
- developed and implemented a Project Management System which defines data dependencies and presents them using Gantt charts;
- undertaken Project Management as a priority activity across all contracts;
- liaised continually with States, Territories and others undertaking work for the Audit; and
- continually revised the Audit Program in liaison with all contractors, developing and then implementing catch up strategies.

Collaborating organisations

In terms of opportunities, the Audit presents multiple opportunities for partnerships, by working across the range of natural resource issues. Partnerships have been developed and continue to be enhanced with Commonwealth, State and Territory agencies; CSIRO; key natural resource management CRCs – Freshwater Ecology, Catchment Hydrology, Coastal Zone Estuary and Waterway Management, and Tropical Savannas; universities; the community through Landcare and Catchment Management Committees; and industry, eg. the horticulture and dairy industries in association with their R&D Corporations. These partnerships bring a breadth of competencies and skills to bear on the Audit's activities and ensure that Audit outcomes are relevant to stakeholders.

Collaboration between the Audit and other organisations has been achieved on several levels:

- ongoing consultation through the Advisory Council, Theme Working Groups and Natural Resources Standing Committees to ensure Audit relevance and uptake of Audit findings;
- Memoranda of Understanding, building a formal component to many partnerships, particularly with the objective of ensuring that the legacy of the Audit is put in place;
- partnerships, bring joint resources to bear for key problems facing Australia's natural resources, doubling Audit $ investment overall; and
- project-based and issues-based interaction, encompassing data and intellectual inputs from natural resource managers from across Australia.

Achievements & Outcomes

Audit achievements and outcomes for 1999–2000 include the following.

- The Australian Natural Resource Atlas – Version One (a working prototype) is now available at <www.nlwra.gov.au/atlas>. This version demonstrates the use of the Atlas with a small set of data from our Water Availability Theme.
- Completion of Theme 1 – Water Availability. This theme has been completed and the report

summarising the Audit's findings and recommendations will be available in August 2000.

- National Land Use Map – Version 1 has been completed. This details the intensive land uses of Australia.
- Dryland Salinity – for the first time in Australia, a nationwide assessment of the groundwater systems that drive dryland salinity has been completed. This science-based framework links environmental processes with scale and types of management action required for effective salinity control and management.
- Completion of Implementation projects in partnership with States and Territories:
  - Dryland salinity – Great Southern, WA;
  - Vegetation Mapping – Walgett Shire, NSW;
  - Rangelands Monitoring Techniques – Burdekin, Qld; Sturt Plateau, NT; and Victoria River Downs, NT & WA;
  - Agricultural Production and Sustainability – Mt Lofty Ranges, SA and Gippsland, Vic; and
  - Ecosystem Health, Social and Economic Aspects of Land Use – Fitzroy, Qld.
- Year 5 Operational Plan – the Audit has received funding for an additional year, extending and building upon current Audit activities to June 2002.
- Framework for continuing Audit activities – a small working group led by AFFA is developing a strategic approach for the continuation of Audit-type activities.

Analysis of performance

Key performance indicators for each Audit objective were defined in the Strategic Plan. All of the performance indicators for 1999–2000 listed in the Strategic Plan were met with progress generally on track on those due in 2000–2001. At most there is a lag in terms of final reporting by six months, with all theme reports due to be completed before June 2001, as compared to December 2000 in the Strategic Plan.

Operational level targets for 1999–2000 were listed within the Annual Operational Plan. The Audit has met the majority of its targets for 1999–2000, with the significant exception being due to delays from putting in place data systems and sponsorship arrangements to follow on from the Audit's current activities. Further details are contained in the 1999–2000 Annual Report of the National Land and Water Resources Audit.

As part of the framework for monitoring Audit performance two key initiatives are in place.

- Continuous reporting through Summary of Audit Projects. This document outlines each project the Audit is working on and its current status. In excess of 130 contracts are underway across the Audit's range of activities. The Summary of Audit Projects is updated every six weeks and is available on the WebSite <www.nlwra.gov.au>.

- Program Evaluation – phase II of the Audit Program Evaluation is underway. An initial report suggesting further improvements to the Audit process is complete with recommendations being implemented. The final Program Evaluation report will be produced in June 2001.

Communication

The key Communication activities of the Audit 1999–2000 were:

- regular messages transmitted to subscribers of the Auditinfo electronic mailing list;
- launch of the water component of the Atlas at World Water Congress, Melbourne;
- development of brochures and other summary information eg. Water in a Dry Land, Australia's Estuaries and Australia's Near Pristine Estuaries;
- development of a CD-ROM for Australian Groundwater Flow Systems Contributing to Dryland Salinity and Ministerial Press Release at ABARE Outlook Conference, 2000;
- contributions to seminars, conferences, newsletters and Ministerial News Releases; and
- briefings of Parliamentarians, State and Territory government agencies and community groups.

Future directions

The 2000–2001 year is a key year for the Audit with all Theme Reports to be completed and work towards the implementation of each of the report's recommendations to be undertaken through the Advisory Council.

During the third full year of Audit activity, the focus will be on:

- **project management** – managing to completion contracts for all Audit projects, ensuring outputs are delivered to specification in a timely and cost effective manner;
- **relevance and reporting** – working with key Commonwealth and State agencies, community and industry to develop Audit findings and ensure Audit outputs meet the decision making needs for Australia's natural resource managers;
- **partnerships** – building further links with government, community and industry, particularly with a focus on implementation of Audit findings;
- **data and information management** – concentrating on data access, data sharing, national sponsorship and data display through the Australian Natural Resources Atlas in close cooperation with ANZLIC, data custodians and information users across Australia;
- **integration** – developing projects that integrate Audit findings and combine natural resources, social and economic data sets; and
- **implementation** – encouraging and facilitating a receptive environment for the application of Audit findings.

The further extension of the Natural Heritage Trust as announced in the Federal Budget 1999–2000 has resulted in the extension of the Audit Program

to June 2002, with an additional budget of $5M. The Audit Advisory Council has agreed that this additional and fifth year of activity will be used to consolidate upon and implement key outcomes of the Audit's findings.

This will be done in the context of appointing National Sponsors for key Land, Water and Native Vegetation data groups to make recommendations for monitoring and reporting regularly on Australia's natural resources and the role and functions of any long-term body that will incorporate the Audit's current functions and roles.

For further Audit information, please consult <www.nlwra.gov.au>.

8 Broad Directions for the Future

Recognising that natural resource management issues are ultimately people issues, LWRRDC is moving to incorporate social, economic and institutional considerations across its R&D portfolio.

The constraints to more sustainable management of natural resources are rarely just technical. They often operate at scales beyond that of the paddock, property or river reach. Changing management at landscape or catchment scales involves social processes which are often less well understood than biophysical phenomena.

Moreover, onground managers of natural resources rarely consider land, water or vegetation management in isolation – they usually have to manage the whole, often for multiple objectives including profit and sustainability. This has significant implications for the ways:

- we conceptualise the research challenge;
- we involve non-scientists in research activities; and
- we package and disseminate the outputs of R&D.

The Board of the Corporation has made a strategic decision to quadruple its communication investment. This enhanced effort will be directed to integrating research findings across a range of programs into products which meet the expressed needs of end-users. Such needs are most likely to be met where end-users have had some

involvement in, and feel some ownership of, the research process.

Unlike the commodity-based R&D Corporations, LWRRDC is not funded by industry levies. This means that we do not have a clearly defined audience for our R&D outputs in the same way as other Corporations have in the producers whose levies have part-funded the research.

However in dealing with the issue of scale – moving from a property scale to a catchment scale and back again – we will also be looking increasingly for opportunities for collaborative R&D with commodity-based R&D Corporations, tackling natural resource management issues on an industry scale. As well as increasing funding leverage for all partners, such collaboration has the advantage for LWRRDC of providing outlets for LWRRDC-funded R&D through well-established, industry-based delivery channels.

Natural resource management policy in Australia is in a state of review and reappraisal. The Commonwealth is reviewing its strategic directions in natural resource management post-Decade of Landcare and post-Natural Heritage Trust. Cabinet deliberations are being informed by the National Land and Water Resources Audit, the 500 public submissions to the Commonwealth discussion paper Managing Natural Resources in Rural Australia for a Sustainable Future, and by a host of recent reports and reviews, including:

- the mid-term review of the Natural Heritage Trust;
- the salinity audit of the Murray-Darling Basin Commission (MDBC) – the MDBC is about to release a new salinity strategy with potentially significant implications for land management in some parts of the Basin;
- the Prime Minister's Science Engineering and Innovation Committee paper on dryland salinity; and
- the Productivity Commission report on Ecologically Sustainable Land Management.

This dynamic policy and institutional context presents a significant challenge for LWRRDC. Several of the Corporation's R&D programs have already generated important findings that are shaping the emerging policy agenda. We are enhancing linkages between LWRRDC-funded programs and natural resource management policy. This is intended to ensure both that our research is informed by policy needs, and also that policy development is based on the most up to date knowledge.

Financial Report

9 Financial Statements

INDEPENDENT AUDIT REPORT

To the Minister for Agriculture, Fisheries and Forestry

Scope

I have audited the financial statements of the Land and Water Resources Research and Development Corporation for the year ended 30 June 2000. The financial statements comprise:

- Statement by Directors;
- Operating Statement;
- Balance Sheet;
- Statement of Cash Flows;
- Schedule of Commitments;
- Schedule of Contingencies; and
- Notes to and forming part of the Financial Statements.

The directors of the Corporation are responsible for the preparation and presentation of the financial statements and the information they contain. I have conducted an independent audit of the financial statements in order to express an opinion on them to you.

The audit has been conducted in accordance with Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards, to provide reasonable assurance as to whether the financial statements are free of material misstatement. Audit procedures included examination, on a test basis, of evidence supporting the amounts and other disclosures in the financial statements, and the evaluation of accounting policies and significant accounting estimates. These procedures have been undertaken to form an opinion as to whether, in all material respects, the financial statements are presented fairly in accordance with Australian Accounting Standards, other mandatory professional reporting requirements and statutory requirements in Australia so as to present a view of the entity which is consistent with my understanding of its financial position, the results of its operations and its cash flows.

The audit opinion expressed in this report has been formed on the above basis.

GPO Box 707 CANBERRA ACT 2601
Centenary House 19 National Circuit
BARTON ACT
Phone (02) 6203 7300 Fax (02) 6203 7777

Audit Opinion

In my opinion,

(i) the financial statements have been prepared in accordance with Schedule 2 of the Finance Minister's Orders; and

(ii) the financial statements give a true and fair view, in accordance with applicable Accounting Standards, other mandatory professional reporting requirements and Schedule 2 of the Finance Minister's Orders, of the financial position of the Land and Water Resources Research and Development Corporation as at 30 June 2000 and the results of its operations and its cash flows for the year then ended.

Australian National Audit Office

Puspa Dash
Senior director

Delegate of the Auditor-General

Canberra

4 September 2000

Quality System

Quality Endorsed Company

ISO 9002 Lic 9505

Land & Water Resources
Research & Development Corporation

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STATEMENT BY DIRECTORS

In our opinion, the attached Financial Statements give a true and fair view of the matters required by Schedule 2 to the Finance Ministers Orders made under the Commonwealth Authorities and Companies Act 1997 for the year ended 30 June 2000.

Signed this first day of September 2000.

A.D. Campbell
Chairman

C.A. Campbell
Executive Director

OPERATING STATEMENT

For the year ended 30 June 2000

	NOTES	2000 $	1999 $
Operating revenues			
Revenues from government	3	**11,049,000**	10,939,000
Third party contributions utilised	4	**12,198,570**	14,855,801
Interest	5A	**349,641**	543,181
Other	5B	**523,470**	509,987
Total operating revenues		**24,120,681**	26,847,969
Operating expenses			
Employees	6A	**2,111,434**	1,817,425
Suppliers	6B	**1,200,292**	991,076
Depreciation and amortisation	6C	**177,750**	71,584
Write-down of assets	6D	**–**	5,841
Grants	6E	**20,394,156**	25,477,482
Total operating expenses	7	**23,883,632**	28,363,408
Operating surplus before extraordinary items		**237,049**	(1,515,439)
Net surplus after extraordinary items		**237,049**	(1,515,439)
Net surplus attributable to the Commonwealth		**237,049**	(1,515,439)
Accumulated surpluses or (deficits) at beginning of reporting period		**1,453,871**	2,969,310
Total available for appropriation		**1,690,920**	1,453,871
Accumulated surpluses at end of reporting period	8	**1,690,920**	1,453,871

The above statement should be read in conjunction with the accompanying notes.

BALANCE SHEET

as at 30 June 2000

	NOTES	2000 $	1999 $
ASSETS			
Financial assets			
Cash	9A	**3,550,879**	6,676,000
Receivables	9B	**682,020**	652,170
Investments	9C	**1,027,923**	1,000,000
Total financial assets		**5,260,822**	8,328,170
Non-financial assets			
Infrastructure, plant and equipment	10A,B	**315,304**	346,725
Intangibles	10C,B	**120,103**	33,129
Total non-financial assets		**435,407**	379,854
Total assets		**5,696,229**	8,708,024
LIABILITIES			
Debt			
Overdraft	11A	**926,077**	2,409,972
Total debt		**926,077**	2,409,972
Provisions and payables			
Employees	12A	**373,050**	295,855
Suppliers	12B	**252,024**	116,809
Grants	12C	**2,454,158**	4,431,517
Total provisions and payables		**3,079,232**	4,844,181
Total liabilities		**4,005,309**	7,254,153
EQUITY			
Accumulated surpluses		**1,690,920**	1,453,871
Total equity		**1,690,920**	1,453,871
Total liabilities and equity		**5,696,229**	8,708,024
Current liabilities		**3,936,521**	7,184,820
Non-current liabilities		**68,788**	69,333
Current assets		**5,260,822**	8,328,170
Non-current assets		**435,407**	379,854

The above statement should be read in conjunction with the accompanying notes.

STATEMENT OF CASH FLOWS

For the year ended 30 June 2000

	NOTES	2000 $	1999 $
Operating activities			
Cash received			
Appropriations		**11,049,000**	10,939,000
Interest		**361,934**	518,609
Third party contributions		**12,987,381**	12,718,270
Other		**251,328**	505,712
Total cash received		**24,649,643**	24,681,591
Cash used			
Employees		**(2,034,239)**	(1,767,345)
Suppliers		**(1,258,391)**	(1,022,328)
Grants		**(22,737,013)**	(24,362,909)
Total cash used		**(26,029,643)**	(27,152,582)
Net cash from operating activities	13.2	**(1,380,000)**	(2,470,991)
Investing activities			
Cash received			
Bills of exchange and promissory notes		**–**	3,587,598
Total cash received		**–**	3,587,598
Cash used			
Purchase of infrastructure, plant and equipment		**(233,303)**	(90,723)
Bills of exchange and promissory notes		**(27,923)**	–
Total cash used		**(261,226)**	(90,723)
Net cash from investing activities		**(261,226)**	3,496,875
Net increase/(decrease) in cash held		**(1,641,226)**	1,025,884
Cash at the beginning of the reporting period		**4,266,028**	3,240,144
Cash at the end of the reporting period	13.1	**2,624,802**	4,266,028

The above statement should be read in conjunction with the accompanying notes.

SCHEDULE OF COMMITMENTS

as at 30 June 2000

	2000	1999
	$	$
BY TYPE		
OTHER COMMITMENTS		
Operating leases[1]	**1,328,288**	408,700
Other commitments[2]	**20,149,227**	23,722,874
Total other commitments payable	**21,477,515**	24,131,574
COMMITMENTS RECEIVABLE	**(1,952,501)**	–
Net commitments	**19,525,014**	24,131,574
BY MATURITY		
All net commitments		
One year or less	**14,285,095**	16,035,725
From 1–2 years	**3,252,088**	6,430,489
From 2–5 years	**1,987,831**	1,665,360
Net commitments	**19,525,014**	24,131,574
Operating lease commitments		
One year or less	**253,460**	175,157
From 1–5 years	**954,075**	233,543
Net operating lease commitments	**1,207,535**	408,700

The above statement should be read in conjunction with the accompanying notes.

NB. All 1999–2000 commitments are GST inclusive where relevant. The commitment receivable represents the GST portion that is recoverable as input tax credits. The comparatives have not been adjusted to reflect the GST. The maturity analysis represents the net commitments.

1. Operating Lease is exclusively in relation to office accommodation.

2. Other commitments comprise future commitments to research organisations and for jointly-funded projects and programs managed by other funding agencies. Payment is dependent upon progress in each funded research project, annual ministerial approval of the Annual Operational Plan and adequate annual appropriation of funds for the Corporation and funding partners.

SCHEDULE OF CONTINGENCIES

as at 30 June 2000

	2000	1999
	$	$
Contingent losses		
Total contingent losses	**0**	0
Net contingencies	**0**	0

The above statement should be read in conjunction with the accompanying notes.

Notes to, and forming part of, the Financial Statements

1. Summary of significant accounting policies

1.1 Basis of accounting

The Land and Water Resources Research and Development Corporation (the 'Corporation') is required by Section 20 of the Commonwealth Authorities and Companies Act 1997 to provide proper accounts and records of the transactions and affairs of the Corporation in accordance with accounting principles, generally applied in commercial practice.

The Financial Statements are required by clause 1(b) of Schedule 1 to the *Commonwealth Authorities and Companies Act 1997* and are a general purpose financial report.

The Statements have been prepared in accordance with:

- Requirements for the Preparation of Financial Statements of Commonwealth Agencies and Authorities made by the Minister for Finance and Administration in August 1999 (Schedule 2 to the Commonwealth Authorities and Companies (CAC) Orders);
- Australian Accounting Standards;
- other authoritative pronouncements of the Australian Accounting Standards Boards; and
- the Consensus Views of the Urgent Issues Group.

The Statements have been prepared having regard to:

- Statements of Accounting Concepts; and
- the Explanatory Notes to Schedule 2 issued by the Department of Finance and Administration.

The Financial Statements have been prepared on an accrual basis and are in accordance with historical cost convention. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position of the Corporation.

1.2 Changes in Accounting Policy

Changes in accounting policy have been identified in this note under their appropriate headings.

1.3 Infrastructure, plant and equipment

Purchases of infrastructure, plant and equipment are recognised initially at cost in the Balance Sheet, except for purchases costing less than $1,000, which are expensed in the year of acquisition (other than where they form part of a group of similar items which are significant in total). Assets purchased from project funds and

greater than the threshold of $5,000 may revert to the Corporation at the end of the project period. At 30 June 2000, no reversions took place. All sundry equipment transferred from the Commonwealth has been written off.

The Corporation did not undertake a revaluation of assets during 1999–2000. The carrying amounts of assets have been assessed to approximate the deprival value and the class of assets are not significant to the Corporation.

Recoverable amount test

The carrying amount of each item of property plant and equipment assets is reviewed to determine whether it is in excess of the asset's recoverable amount. If an excess exists as at the reporting date, the asset is written down to its recoverable amount immediately. In assessing recoverable amounts, the relevant cash flows, including the expected cash inflows from future appropriations by the Parliament, have been discounted to their present value.

The application of the recoverable amount test to the non-current assets of the Corporation is a change of accounting policy required by the Finance Minister's Orders in 1999–2000. No write-down to recoverable amount has been made in 1999–2000 as a result of this change in policy.

Depreciation and Amortisation

Depreciable infrastructure, plant and equipment are written off to their estimated residual values over their estimated useful lives to the Corporation using the straight-line method of depreciation. Useful lives and residual values are reviewed at each balance date and necessary adjustments made. Leasehold improvements are amortised on a straight-line basis over the lesser of the estimated useful life of the improvements or the unexpired period of the lease, this being four years.

Depreciation and amortisation rates applying to each class of depreciable asset are based on the following useful lives:

	1999–2000	**1998–99**
Leasehold improvements	**Lease term**	Lease term
Plant and equipment	**3–8 years**	3–8 years

The aggregate amount of depreciation allocated for each class of asset during the reporting period is disclosed in *Note 6C*.

1.4 Taxation

The Corporation is liable to sales tax (until 30 June 2000), payroll tax, fringe benefits tax, stamp duty and goods and services tax (effective 1 July 2000). The Corporation is exempt from the payment of income tax under clause 46(1) of the *Primary Industries and Energy Research and Development Act 1989 (PIERD Act)*.

1.5 Reporting by Outcomes

A comparison of Budget and Actual figures by outcome specified in the Appropriation Acts relevant to the Corporation is presented in *Note 2*. Any intra-government costs included in the figure 'net cost to Budget outcomes' are eliminated in calculating the actual budget outcome for the Government overall.

1.6 Appropriations

From 1 July 1999, the Commonwealth Budget has been prepared under an accruals framework. Under this framework, Parliament appropriates moneys to the Corporation as revenue appropriations. Revenues from government are revenues of the core operating activities of the Corporation. Appropriations for outputs are recognised as revenue to the extent they have been received into the Corporation's Bank account or are entitled to be received by the Corporation at year-end.

1.7 Other Revenue

Interest revenue is recognised on a proportional basis taking into account the interest rates applicable to the financial assets.

Revenue from the rendering of a service is recognised by reference to the stage of completion of contracts or other agreements to provide services to other bodies. The stage of completion is determined according to the proportion that costs incurred to date bear to the estimated total costs of the transaction.

The Corporation receives revenue from third parties for the management of collaborative programs and projects (see *Note 4*).

1.8 Grants Expenditure

Research and Development grants are expensed as incurred. At 30 June 2000, there was no property income due from funded research and development projects other than those re-applied within some projects.

The Corporation has debited all items of expenditure against each individual R&D program account where a program management committee has been formed. These items include funding for research and development projects, scoping reviews, communications and other *ad hoc* management expenses related directly to the research *(see Note 7)*.

The Corporation recognises grant liabilities as follows.

Most grant agreements require the grantee to perform services or provide facilities, or to meet eligibility criteria. In these cases, liabilities are recognised only to the extent that the services required have been performed or the eligibility criteria have been satisfied by the grantee. (Where grants moneys are paid in advance of performance or eligibility, a prepayment is recognised).

In cases where grant agreements are made without conditions to be monitored, liabilities are recognised on signing of the agreement.

1.9 Employee Entitlements

Provision has been made for recreation and long service leave employee entitlements. The provision for annual leave reflects the value of total annual leave entitlements of all employees at 30 June 2000 based on current salaries, including related on-costs and is recognised at its nominal value. The liability for long service leave is recognised and measured at the present value of the estimated future cash flows to be made in respect of all employees at 30 June 2000. In determining the present value of the liability, attrition rates and pay increases through promotion and inflation have been taken into account.

No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave taken by employees is less than the annual sick leave entitlement.

1.10 Payables

Creditors are defined as future payments that the Corporation is obliged to make to other bodies as a result of transactions or other events during the financial year and third party contributions not expensed at balance date. The research funding payments, as shown at *Note 12C* as Grants: non-profit institutions, are dependent on receipt of satisfactory final reports from the respective research organisations.

1.11 Economic dependency

The Corporation is largely dependent upon the appropriation of moneys by Parliament to meet its operations and commitments.

1.12 Leases

Operating lease payments are expensed on a basis which is representative of the pattern of benefits derived from the leased assets. The net present value of future net outlays in respect of surplus space under non-cancellable lease agreements is expensed in the period in which the space becomes surplus.

1.13 Bad and doubtful debts

Bad debts are written off to expense during the year in which they are identified, to the extent they have not previously been provided for. A provision is raised for doubtful debts based on a review of all outstanding receivables at year-end.

1.14 Cash

Cash includes deposits held at call with banks. Bank accounts that are in an overdraft position are included as Debt in *Note 11.*

1.15 Intangibles

The carrying amount of each intangible assets is reviewed to determine whether it is in excess of the asset's recoverable amount. If an excess exists as at the reporting date, the asset is written down to its recoverable amount immediately. In assessing recoverable amounts, the relevant cash flows, including expected cash inflows from future appropriations by the Parliament, have been discounted to their present value.

The application of the recoverable amount test to the intangible assets of the Corporation is a change of accounting policy required by the Finance Minister's Orders in 1999–2000. No write-down to recoverable amount has been made in 1999–2000 as a result of this change in policy.

Intangible assets comprise externally acquired and internally developed software. Software is amortised on a straight-line basis over it's anticipated useful life after it is commissioned into use. Useful lives for commissioned software are:

	1999–2000	1998–99
Externally acquired software	**3 to 4 yrs**	3 to 4 years

1.16 Comparative figures

Comparative figures have been adjusted to conform to changes in presentation in these financial statements where required.

Comparatives are not presented in Notes dealing with the reporting on Outcomes, due to 1999–2000 being the first year of the implementation of accrual budgeting.

1.17 Financial instruments

Accounting policies in relation to financial instruments are disclosed in *Note 19.*

2. Reporting by outcomes

The Corporation operates across primary industries and segments in the water and wastewater industries. The principal activities of the Corporation are the co-ordination and funding of research and development for the sustainable use of land, water and vegetation resources. The Corporation operates predominantly in one geographic area, this being Australia.

The Corporation is structured to meet one outcome:

To provide national leadership in utilising research and development to improve the long-term productive capacity, sustainable use, management and conservation of Australia's land, water and vegetation resources.

Reporting by Outcomes for 1999–2000

	Outcome	
	Budget	Actual
Net cost of entity outputs	11,204,000	10,811,951
Net cost to Budget Outcome	11,204,000	10,811,951
Total assets deployed as at 30/6/00	3,387,000	5,696,229
Net assets deployed as at 30/6/00	787,000	1,690,920

Reporting by Outcome by funding source for 1999–2000

Outcome	Outputs					Total appro-priations	Total expenses
	Expenses against revenue, by source				Total expenses against outputs		
	Government (Appropriations) (B)			Other sources (C)		D=B	
	Special Appro-priation	Annual Appro-priation Acts	Total				
Actual	–	11,049,000	11,049,000	12,834,632	23,883,632	11,049,000	23,883,632
Budget	–	11,103,000	11,103,000	15,069,000	26,172,000	11,103,000	26,172,000

3. Revenue from Government

	2000	1999
	$	$
Government appropriations	**11,049,000**	10,939,000

4. Third party contributions

Third party contributions were received for the following programs and projects in which the Corporation was a participant and managed the activity on behalf of other funding agencies:

ACTIVITY	**Utilised 2000 $**	Utilised 1999 $	**Not yet utilised 2000 $**	Not yet utilised 1999 $
Soil health	0	5,000	0	0
National dryland salinity R&D	585,130	185,220	299,870	0
Climate variability in agriculture	1,287,199	1,487,091	812,566	712,849
Environmental mgmt. of military lands	146,488	166,420	0	0
National river health program (NRHP)	68,739	134,920	0	68,739
NRHP – state/territory monitoring sub-program	24,319	274,463	17,698	42,017
National eutrophication management	313,999	473,845	76,075	30,074
Pesticide program	0	19,120	0	0
Irrigation R&D	414,107	1,046,988	108,650	0
National Rivers Consortium	155,879	259,380	102,303	43,182
Riparian lands	40,000	0	0	0
National rangelands R&D	25,000	32,900	0	0
National remnant vegetation R&D	0	460,254	0	0
National Land and Water Resources Audit	9,020,788	10,239,410	587,052	178,542
Joint research and development projects	116,922	70,790	0	0
Total	**12,198,570**	14,855,801	**2,004,214**	1,075,403

Of the third party contributions received, $12,198,570 has been recognised as income at balance date (1998-99, $14,855,801). The amount not yet utilised as at year ended 30 June 2000 has been included as a creditor *(see Note 11c).*

5. Operating Revenues

	2000	1999
	$	$
5A. Interest		
Deposits	**349,641**	543,181
Total	**349,641**	543,181
5B. Other revenues		
Return of R&D funds	**383,100**	407,549
Publication sales	**20,916**	16,562
Other sundry items	**119,454**	85,876
Total	**523,470**	509,987

6. Operating expenses – goods and services

6A. Employee expenses		
Remuneration (for services provided)	**2,039,445**	1,752,404
Other employee expenses	**71,989**	65,021
Total	**2,111,434**	1,817,425
6B. Suppliers' expenses		
Supply of goods and services	**1,015,692**	821,741
Operating lease rentals	**184,600**	169,335
Total	**1,200,292**	991,076
6C. Depreciation and amortisation		
Depreciation of infrastructure, plant and equipment	**108,408**	42,445
Amortisation of lease hold improvements	**61,420**	24,420
Amortisation of computer software	**7,922**	4,719
Total	**177,750**	71,584
6D. Write-down of assets		
Non-financial assets:		
Plant and equipment – revaluation decrement	**-**	–
Plant and equipment – write-off	**–**	5,841
Total	**–**	5,841

6E. Operating Expenses – Grants

	2000	1999
	$	$
Non-profit institutions	**14,390,269**	16,978,009
Grants to commercial entities	**6,003,887**	8,499,473
Total	**20,394,156**	25,477,482

7. Total operating expenses

Total operating expenses are classified by functional type as follows:

Administration	**1,288,572**	1,211,138
Research and development grants		
Commissioned R&D programs	**11,026,439**	14,360,152
General Call	**1,422,045**	1,842,867
National Land and Water Resources Audit	**9,132,901**	10,281,816
Strategic planning and management	**408,019**	84,704
Review and evaluation	**69,198**	128,695
Communications and technology	**536,458**	454,036
Total	**23,883,632**	28,363,408

8. Accumulated results

Balance at 1 July 1999	**1,453,871**	2,969,310
Surplus/ (Deficit)	**237,049**	(1,515,439)
Balance at 30 June 2000	**1,690,920**	1,453,871

The Corporation maintains only a small prudential reserve to cover contingencies in its R&D portfolio.

9. Financial assets

9A. Cash

Deposits at call	**3,549,761**	6,673,894
Cash on hand	**1,118**	2,106
Total	**3,550,879**	6,676,000

9B. Receivables

	2000	1999
	$	$
Goods and services	**645,449**	603,307
Less: Provision for doubtful debts	**–**	–
	645,449	603,307
Other debtors	**36,571**	48,863
Total receivables	**682,020**	652,170
Receivables (gross) which are overdue are aged as follows:		
Not overdue	**36,571**	48,863
Overdue by:		
• less than 30 days	**253,699**	532,626
• 30–60 days	**1,750**	–
• 60–90 days	**346,087**	681
• more than 90 days	**43,913**	70,000
	682,020	652,170
Total receivables (gross)	**682,020**	652,170

9C. Investments

Term deposit	**1,027,923**	1,000,000
Total	**1,027,923**	1,000,000

10. Non-financial assets

10A. Infrastructure, plant and equipment

Office equipment	**416,674**	283,542
Accumulated depreciation	**(180,596)**	(81,743)
	236,078	201,799
Furniture and fittings	**51,238**	49,436
Accumulated depreciation	**(40,887)**	(28,457)
	10,351	20,979
Leasehold modifications	**179,135**	172,787
Accumulated depreciation	**(110,260)**	(48,840)
	68,875	123,947
Total plant and equipment	**315,304**	346,725

10B. Analysis of property, plant, equipment and intangibles

Movement summary 1999–2000 for all assets irrespective of valuation basis (consolidated only)

Item	Office equipment	Furniture & fittings	Lease modifi-cations	Computer software	Total
Gross value as at 1 July 1999	283,542	49,436	172,787	45,330	551,095
Additions – acquisition of new assets	133,132	1,802	6,348	92,021	233,303
Disposals		–	–		–
Gross value as at 30 June 2000	416,674	51,238	179,135	137,351	784,398
Accumulated depreciation/amorti-sation charge as at 1 July 1999	84,618	28,457	48,840	9,326	171,241
Depreciation/amortisation charge for assets held 1 July 1999	88,260	12,426	61,420	5,686	167,792
Depreciation/amortisation charge for additions	7,718	4	–	2,236	9,958
Disposals	–	–	–	–	–
Accumulated depreciation/amorti-sation charge as at 30 June 2000	180,596	40,887	110,260	17,248	348,991
Net book value as at 30 June 2000	**236,078**	**10,351**	**68,875**	**120,103**	**435,407**
Net book value as at 1 July 1999	**201,799**	**20,979**	**123,947**	**33,129**	**379,854**

	2000	1999
	$	$
10C. Intangibles		
Computer software:		
Externally acquired – at cost	**39,063**	25,392
Accumulated Amortisation	**(17,248)**	(12,201)
	21,815	13,191
Internally developed – in progress	**98,288**	19,938
Total	**120,103**	33,129

11. Debt

	2000 $	1999 $
11A. Overdraft		
Cash at bank	**926,077**	2,409,972

12. Provisions and payables

12A. Employees		
Salaries and wages	**168,719**	110,678
Leave	**204,331**	185,177
Total	**373,050**	295,855
12B. Suppliers		
Trade creditors	**252,024**	116,809
Operating lease rentals	**–**	–
Total	**252,024**	116,809
12C. Grants liabilities		
Non-profit institutions	**254,944**	2,821,114
Contributions not yet utilised (see Note 4)	**2,004,214**	1,075,403
Contributions in advance	**195,000**	535,000
Total	**2,454,158**	4,431,517

13. Statement of cash flows

13.1 Reconciliation of cash

Cash at the end of the reporting period as shown in the Statement of Cash Flows and in the balance sheet is as follows:

Overdraft	**(926,077)**	(2,409,972)
Cash at bank and on hand	**3,550,879**	6,676,000
Balance of cash as at 30 June	**2,624,802**	4,266,028

13.2 Cash flow reconciliation

Reconciliation of operating surplus to net cash provided by operating activities

	2000	1999
	$	$
Operating surplus (deficit) of operating revenues over expenses	**237,049**	(1,515,439)
Depreciation and amortisation of non-current assets	**177,750**	71,584
Write-down of assets	**–**	5,841
Changes in assets and liabilities		
(Increase)/decrease in receivables	**(29,850)**	(278,705)
(Increase)/decrease in other assets	**–**	14,794
Increase/(decrease) in contributions in advance	**(340,000)**	335,000
Increase/(decrease) in contributions not yet utilised	**928,811**	(2,218,398)
Increase/(decrease) in employee provisions	**77,195**	19,129
Increase/(decrease) in trade creditors	**135,215**	(19,370)
Increase/(decrease) in grants payable	**(2,566,170)**	1,114,573
Net cash from operating activities	**(1,380,000)**	(2,470,991)

14. Resources received free of charge

There were no resources received free of charge during 1999–2000 (1998–99, nil).

15. Superannuation

Employer contributions to the Commonwealth Superannuation Scheme and Public Sector Superannuation Scheme was provided on behalf of the staff and Directors of the Corporation. Employer contributions amounting to $238,392 (1998–99, $215,751) for the Corporation in relation to these schemes have been expensed in these financial statements.

16. Subsequent events

Since balance date, the Corporation is not aware of any events that have occurred which will effect the amounts disclosed in the Financial Statements.

17. Related party disclosures

17.1 Remuneration of Directors

The part-time Directors of the Corporation received a remuneration and allowances as determined by the Remuneration Tribunal. In accordance with the *PIERD Act*, the

part-time Directors are appointed by a Selection Committee. The Executive Director was the only full-time Director of the Corporation.

	2000	1999
	$	$
Aggregate amount of superannuation payments	**21,334**	34,068
Other remuneration received or due and receivable by Directors of the Corporation	**264,930**	232,009
Total remuneration received or due and receivable by Directors of the Corporation	**286,264**	266,077

The number of Directors of the Corporation included in these figures are shown below in the relevant remuneration bands:

• Nil	–	$ 10,000	**1**	2
• $ 10,001	–	$ 20,000	**6**	5
• $ 20,001	–	$ 30,000	**–**	1
• $ 30,001	–	$ 40,000	**1**	–
• $130,001	–	$140,000	**1**	1
			9	9

17.2 Directors

The Directors of the Corporation at any time during the reporting period were as follows:

Mr J Alexandra	–	(Reappointed 1 July 1999)
Mrs L Boully	–	(Reappointed 1 July 1999)
Prof. S Bunn	–	(Appointed 1 July 1999)
Mr AD Campbell	–	(Chairperson – reappointed 1 July 1999)
Mr CA Campbell	–	(Executive Director – appointed February 2000)
Mrs S Donaldson	–	(Appointed 1 July 1999)
Mr M Logan	–	(Appointed 1 July 1999)
Dr P Price	–	(Executive Director – ceased January 2000)
Mr W Watkins	–	(Reappointed 1 July 1999)
Mr C Willcocks	–	(Government Director – appointed March 1998)

17.3 Loans with Directors and Director-related entities

There were no loans made to Directors or Director-related entities.

17.4 Transactions with Director-related entities

Grants were made to the following Director-related entities. The Directors involved took no part in the relevant decisions of the Board.

Mrs L Boully	Member, CSIRO Biodiversity Sector Advisory Committee.
Prof. S Bunn	Director, Centre for Catchment and In-Steam Research, Griffith University.
Mr CA Campbell	Director, Rural Extension Centre, University of Queensland.
	Member, CSIRO Land and Water Sector Advisory Committee.
Mrs S Donaldson	Member, Advisory Committee, Centre for Resource and Environmental Studies, Australian National University.
Dr P Price	Member, Advisory Board for the Resource Sciences Centre, Queensland Department of Natural Resources;
	Member, CSIRO Land and Water Sector Advisory Committee.
Mr C Willcocks	Assistant Secretary, Landcare and NHT Branch,
	Agriculture, Fisheries and Forestry Australia;
	Member, Advisory Committee, Centre for Resource and Environmental Studies, Australian National University.

The Corporation provided research funding to the above agencies. These transactions occurred within the normal terms and conditions of research and development grants.

	2000	1999
	$	$
Grants made to Director-related entities	**5,453,224**	3,364,001

These grants for the 1999–2000 year were provided to director related entities as follows:

Entity	
Australian National University	492,110
CSIRO Land and Water and Biodiversity Sectors	4,053,736
Griffith University	169,350
Queensland Department of Natural Resources	666,055
University of Queensland	71,973
Total	5,453,224

The Corporation has also received contributions from director related entities to jointly-funded projects with the National Landcare Program, Agriculture, Fisheries and Forestry Australia. These transactions occurred within the normal terms and conditions of research and development grants.

17.5 Remuneration of Officers

The officer remuneration includes all officers concerned with or taking part in the management of the Corporation during 1999–2000 except the Executive Director. Details in relation to the Executive Director have been incorporated in *Note 16.1 – Remuneration of Directors*.

The number of officers included in these figures are shown below in the relevant income bands:

	2000	1999
Between $100,001 – $110,000	**3**	4
Between $130,001 – $140,000	**1**	–
	4	4

	2000	1999
	$	$
Superannuation payments to officers	**61,694**	82,103
Other remuneration received or due and receivable	**395,306**	310,606
Income received or due and receivable by officers	**457,000**	392,709

18. Remuneration of Auditors

	2000	1999
	$	$
Remuneration to the Auditor-General for auditing the financial statements for the reporting period	**12,000**	12,000

No other services were provided by the Auditor-General during the reporting period.

19. Financial instruments

(a) Terms, conditions and accounting policy

Financial Instrument	Notes	Accounting policies and methods (including recognition criteria and measurement basis)	Nature of underlying instrument (including significant terms & conditions affecting the amount, timing and certainty of cash flows)
Financial assets		Financial assets are recognised when control over future economic benefits is established and the amount of the benefit can be reliably measured	
Cash at bank	11A	The balance is recognised at the nominal amount. Interest is credited to revenue as it accrues. A negative balance arises when unpresented cheques exceed the current bank balance and this is disclosed as an overdraft.	Temporarily surplus funds, mainly from monthly drawdowns of appropriation, are placed in a cheque account with the Commonwealth Bank. Interest is earned on the daily balance at the prevailing daily rate for money on call and is paid at month end. CBA Bank Rating: AAA
Cash on hand		Petty cash held on premises	
Deposits at call	9A	Deposits are recognised at their nominal amounts. Interest is credited to revenue as it accrues	Temporarily surplus funds, mainly from monthly drawdowns of appropriation, are placed on deposit at call with the Commonwealth Bank and Bankers Trust. Interest is earned on the daily balance at the prevailing daily rate for money on call and is paid at month end. CBA Bank Rating: AAA. Bankers Trust Bank Rating: AAA
Receivables for goods & services	9B	These receivables are recognised at the nominal amounts due less any provision for bad and doubtful debts. Provisions are made when collection of the debt is judged to be less rather than more likely.	Credit terms are net 14 days (1999-2000: 14 days)
Term deposit	9C	The deposit is recognised at cost. Interest is recognised as it accrues.	The deposits are with Trust Bank and Adelaide Bank, maturing in 2000-2001, and they earn an effective rate of interest of 5.55% and 6.40% respectively. Interest is payable on maturity. Trust Bank Rating: A2; Adelaide Bank Rating A2
Financial liabilities		Financial liabilities are recognised when a present obligation to another party is entered into and the amount of the liability can be reliably measured.	
Contributions not yet utilised and in advance	11C	The Corporation brings income to account in the same period as expenditure is incurred; therefore any contributions not utilised are recorded as a liability.	There are agreements with third party contributors that contributions will be spent on R&D projects and other activities relating to specified programs. The Corporation is the administrator of the funds.
Trade creditors	11B	Creditors and accruals are recognised at their nominal amounts, being the amounts at which the liabilities will be settled. Lia–bilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).	Settlement is usually made net 14 days.
Grants: non-profit institutions	11C	The Corporation recognises a liability on the signing of grant agreements. The amount of the liability is for the total of all payments under the agreement, which are no longer at the Corporation's discretion. The part of the liability recognised in the Balance Sheet comprises payments, which are more rather than less likely to be made.	Grant payments are made in instalments according to the grantee meeting agreed milestones and subject to funds being appropriated annually by the Parliament. The Corporation does not necessarily appropriate the benefits of the research to itself and any benefit it receives will only coincidentally approximate in value the grant made.

(b) Interest Rate Risk

Financial Instrument	Notes	Floating Interest Rate		Fixed Interest Rate		Fixed Interest Rate		Non-Interest bearing		Total		Weighted Average	
				1 year or less		1 to 2 years						Effective Int. Rate	
		99–00 $	98–99 $	99–00 $	98–99 $	99–00 $	98–99 $	99–00 $	98–99 $	99–00 $	98–99 $	99–00 %	98–99 %
Financial Assets (Recognised)													
Cash on hand		–	–	–	–	–	–	**1,118**	2,106	**1,118**	2,106		
Deposits at call	9A	**3,549,761**	6,673,893		–	–	–			**3,549,761**	6,673,893	5.7	4.5
Receivables for goods and services	9B	–	–	–	–	–	–	**682,020**	652,170	**682,020**	652,170		
Term deposit	9C	–	–	**1,027,923**	1,000,000	–	–	–	–	**1,027,923**	1,000,000	6.0	5.2
Total Financial Assets (Recognised)		**3,549,761**	6,673,893	**1,027,923**	1,000,000	–	–	**683,138**	654,276	**5,260,822**	8,328,169		
Total assets										**5,696,229**	8,708,024		
Financial Liabilities (Recognised)													
Cash at bank	11A	**926,077**	2,409,972	–	–	–	–	–	–	**926,077**	2,409,972	3.4	2.7
Contributions not yet utilised and in advance	12C	–	–	–	–	–	–	**2,199,215**	1,610,403	**2,199,215**	1,610,403		
Trade creditors	12B	–	–	–	–	–	–	**252,024**	116,809	**252,024**	116,809		
Grants: non-profit institutions	12C	–	–	–	–	–	–	**254,944**	2,821,114	**254,944**	2,821,114		
Total Financial Liabilities (Recognised)		**926,077**	2,409,972					**2,706,183**	4,548,326	**3,632,260**	6,958,298		
Total Liabilities										**4,005,309**	7,254,153		

(c) Net fair values of financial assets and liabilities

Financial assets.

The net fair values of financial assets approximate the carrying value of financial assets.

Financial liabilities.

The net fair values of financial liabilities approximate the carrying value of financial liabilities.

(d) Credit risk exposures

The Corporation's maximum exposures to credit risk at reporting date in relation to each class of recognised financial asset is the carrying amount of those assets as indicated in the Balance Sheet.

The Corporation has no significant exposures to any concentration of credit risk.

Appendices

Appendix 1
LWRRDC Publications List

This list identifies materials published between 1 July 1999 and 30 June 2000. LWRRDC saleable publications are available from the AFFA Shopfront on freecall1-800-020-157. LWRRDC free publications, eg. newsletters, are available by contacting the Corporation on (02) 6257 3379 or email: <public@lwrrdc.gov.au>.

Occasional Papers Series (ISSN 1320-0992)

OP 08/00	*NPIRD Review*	Agtrans Research	ISBN 0 642 76034 9 ISBN 0 642 76035 7 (web)	$12 Print-on-demand
OP 06/00	*Review of Delivery Mechanisms for LWRRDC Water Programs*	Atech Group	ISBN 0 642 76032 2 ISBN 0 642 76033 0 (web)	$12 Print-on-demand
OP 05/00	*The National Eutrophication Management Program – A Review*	Agtrans Research	ISBN 0 642 76026 8 ISBN 0 642 76027 6 (web)	$12 Print-on-demand

OP 03/00	*Evaluation of the LWRRDC Rehabilitation and Management of Riparian Lands Program*	VCG Australia Pty Ltd	ISBN 0 642 76022 5 ISBN 0 642 76023 3 (web)	$20
OP 26/99	*Cost of algal blooms*	Atech Group	ISBN 0 642 76014 4 ISBN 0 642 76015 2 (web)	$20
OP25/99	*Riverine & Wetland Salinity Impacts – Assessment of R & D Needs*	Paul C. E. Bailey & Kimberley James	ISBN 0 642 26779 0 ISBN 0 642 76044 6 (web)	$10
OP24/99	*Datasheets on Natural Resource Issues 1999*	LWRRDC	ISBN 0 642 26778 2	$12 Print-on - demand
OP23/99	*Greenhouse, carbon trading and land management*	Hassall & Associates	ISBN 0 642 26776 6 ISBN 0 642 76011 X (web)	$10
OP22/99	*A Phytoplankton Methods Manual for Australian Freshwaters*	Roger Croome, Gertraud Hotzel	ISBN 0 642 26771 5 ISBN 0 642 76010 1 (web)	$20
OP20/99	*SEEM (Simple Estuarine Eutrophication Models) User's Manual (Urban sub-program Report No 13)*	Dr John Parslow, A. Davidson, J. Hunter	ISBN 0642 26770 7	Free
OP19/99	*Estuarine Eutrophication Models (Urban sub-program Report No 12)*	Dr John Parslow, J. Hunter, A. Davidson	ISBN 0 642 26769 3	Free
OP16/99	*A Physical Classification of Estuaries (Urban sub-program Report No 9)*	M.J. Digby, Prof. Peter Saenger, M.B. Whelan, D. McConchie, B. Eyre, N. Holmes, D. Bucher	ISBN 0 642 26766 9	Free
OP17/99	*Assessing the Ecological Health of Estuaries in Australia (Urban sub-program Report No 10)*	Mr David Deeley, E.I. Paling	ISBN 0 642 26767 7	Free
OP15/99	*Sediment Chemistry Macroinvertebrate Fauna Relationships in Urban Streams (Urban sub-program Report No 9)*	Dr Nick O'Connor, K. Lewin, S. Moore, E. Bradshaw	ISBN 0 642 26765 0	Free
OP07/99	*Limiting Nutrient Workshop 1997*	Alistar Robertson	ISBN 0 642 26755 3 ISBN 0 642 76012 8 (web)	$15
OP03/99	*Contamination of Australian Groundwater Systems with Nitrate*	P. Bolger & M. Stevens	ISBN: 0 642 26749 9	$20

Impacts of Research Series (ISSN 1328-4320)

IR01/00	*Investment in Natural Resources R&D: A Synthesis of Life of Project Evaluations*	Agtrans Research	ISBN 0 642 76016 0 ISBN 0 642 76017 9 (web)	$20
IR03/99	*Evaluation of the Impact of Research Projects Relating to Australia's Natural Resources (1995–96 Group; Phase 2)*	ACIL Consulting	ISBN 0 642 26772 3 ISBN 0 642 76013 6 (web)	$8
IR02/99	*Evaluation of the Impact of Research Projects Relating to Australia's Natural Resources (Second Update 1993 Group)*	S.R. Harrison, C.A. Tisdell, J.G. Tisdell and M.J. McGregor	ISBN 0 642 26754 5 ISBN 0 642 76031 4 (web)	$20
IR01/99	*Evaluation of the Impact of Research Projects Relating to Australia's Natural Resources (1998 Series)*	Atech Group Pty Ltd	ISBN 0 642 26753 7 ISBN 0 642 26777 4 (web)	$15

Climate Variability Program Occasional Paper Series (ISSN 1324-7328)

CV02/99	*Agricultural Climate Research and Services in Australia*	David White, Graeme Tupper and Harpal Mavi	ISBN 0 642 26757 X	$15
CV01/99	*Climate variability and drought research in relation to Australian agriculture*	David White, Graeme Tupper and Harpal Mavi	ISBN 0 642 26756 1	$20

Other LWRRDC Publications

	Annual Report 1998–99		ISSN 1037-6658 (web)	Free
	Stakeholders Report 1999		ISSN 1323-4242 (web)	Free
	LWRRDC (brochure) Land & Water & Vegetation Natural Resources Management R&D		–	Free
	Listing of LWRRDC-Funded R&D: Current Projects and Final Reports June 1999		ISSN 1441-7014 (web)	$5
	A Rehabilitation Manual for Australian Streams Volumes 1&2	Ian Rutherfurd, Kathryn Jerie & Nicholas Marsh	ISBN not assigned for print ISBN 0 642 76028 4 (web)	$25 set
	Riparian Land Management Technical Guidelines		Vol. 1: ISBN 0 642 26773 1 Vol. 2: ISBN 0 642 26774 X	$25 set
One of 3	*Are there seeds in your wetland? Assessing wetland vegetation*	Sally Berridge	ISBN 0 642 266921	Free

Newsletters Issue Numbers

INTERSECT	21	ISSN 1326-2475	Free
CLIMAG	2–3	ISSN 1441-7987	Free
Focus	14–17	ISSN 1321-4381	Free
RIPRAP	14–16	ISSN 1324-6941	Free
WaterWheel	11–13	ISSN 1324-4604	Free
Rivers for the Future	10–11	ISSN 1325-1953	Free
Innovate Australia (published by joint R&D Corporations)	2–5	ISSN 1442-6277	Free

Miscellaneous Publications

Australian Landcare	September and December 1999; March and June 2000	ISSN 1440-4397	Free
SALT – a magazine of the National Dryland Salinity Program	2–	–	Free

Appendix 2
National Land and Water Resources Audit (Audit) Publications List

This is a list of documents and reports completed over the period of the Audit till July 2000. All Audit reports or their executive summaries are available through the Audit WebSite at <www.nlwra.gov.au> or by contacting the Audit office.

Annual Reports

Annual Report 1997–1998	ISBN 0 642 37101 6
Annual Report 1998–1999	ISBN 0 642 37102 4
Annual Report 1999–2000	ISBN 0 642 37104 0

OperationaL Plans

Annual Operational Plan 1998–1999

Annual Operational Plan 1999–2000

Annual Operational Plan 2000–2001

Strategic Plan

National Land and Water Resources Audit: Strategic Plan 1998–2001 ISBN 0 642 37100 8

FAST FACTS	**ISSN 1440 4745**
fast facts 1	*Objectives and Outcomes of the Audit* March 1998, revised October 1998
fast facts 2	*Developing the Audit Priorities* March 1998, withdrawn, replaced by *fast facts 5 and 6* July 1998
fast facts 3	*Water and the Audit* March 1998; withdrawn, replaced by *fast facts 9* May 1999
fast facts 4	*Data Management* March 1998, replaced by *fast facts* October 1999
fast facts 5	*Overview of Audit Themes* July 1998, revised October 1998
fast facts 6	*Description of Audit Themes* July 1998, revised May 1999
fast facts 7	*Implementation Projects* October 1998
fast facts 8	*Assessment Process for Water Infrastructure Proposals* May 1999
fast facts 9	*Water Availability Work Plan* May 1999
fast facts 10	*Rangelands Monitoring Work Plan* May 1999
fast facts 11	*Dryland Salinity Work Plan* May 1999
fast facts 12	*Australian Soil Resources Information System* May 1999
fast facts 13	*Land use Mapping Project* May 1999
fast facts 14	*Vegetation Cover, Condition and Use Work Plan* October 1999
fast facts 15	*Agricultural Productivity and Sustainability Work Plan* October 1999
fast facts 16	*Capacity for Change Work Plan* October 1999
fast facts 17	*Audit WebSite* October 1999
fast facts 18	*AuditInfo Electronic Mailing List* October 1999
fast facts 19	*Data Work Plan* October 1999

Brochures

Guide to the National Land and Water Resources Audit, April 1998, revised October 1998

Decision making for the future: outcomes from the National Land and Water Resources Audit, a Program of the Natural Heritage Trust, April 1999

Water in a Dry Land – March 2000

Australia's Estuaries – March 2000

Australia's Near Pristine Estuaries – May 2000

Posters

Mission of the National Land and Water Resources Audit

Turning data into understanding

Rangelands monitoring

CD-ROM

Australian Groundwater Flow Systems Contributing to Dryland Salinity. – February 2000

Audit Progress and Outputs – May 2000

Reports and Publications

Decision Support:

Large Water Resource Developments – An Integrated Assessment Process

Implementation Projects

Using Natural Resource Inventory Data to Improve the Management of Dryland Salinity in the Great Southern, WA.

Land Cover and Vegetation Change – Mt Lofty Ranges, SA

Regional data compilation and assessment technique for Natural Resource Management – West Gippsland, Victoria

Assessing the status, conditions and trends of native vegetation communities to support vegetation management in low rainfall cropping lands – Walgett, NSW

Satellite based Range Monitoring in Northern Australia

Developing Farming Systems and Improving Catchment Health – Fitzroy, Qld.

Themes

Theme 1	Report: Australian Water Resources Assessment 2000 – Surface and Groundwater Water Availability
Theme 1 –	Implementation of surface and groundwater management – availability, allocation, use and efficiency of use – Victoria, SA, ACT, NSW, NT, WA, Qld.
Theme 3 –	NVIS Implementation Strategy
	NVIS Vegetation Attributes
	NVIS Database System Specification
	NVIS Data Compiler Functional Specification
	NVIS Data Compiler User's Guide
Theme 4 –	Ecosystem Function Analysis Framework
	Indicators within a decision framework
Theme 7 –	Ecosystem Health – Riverine Vegetation Scoping Exercises

Appendix 3
Listing of LWRRDC R&D Projects (1999–2000)

LWRRDC publishes an annual Listing of LWRRDC-funded R&D Current Projects and Final Reports. The current edition is available as a searchable database at <www.infoscan.com.au/LWRRDC99/LWRRDCIntro.htm>; or as a saleable publication for $5 from the AFFA Shopfront on freecall 1-800-020 157.

This Appendix is an abbreviated listing of current LWRRDC R&D projects (ie. those with investments during 1999– 2000). They are grouped by Program title.

Contact details for the projects and researchers are available from either the Internet or the saleable Listing publication. Alternatively, please contact LWRRDC for any additional information at <public@lwrrdc.gov.au>, facsimile (02) 6257 3420 or telephone (02) 6257 3379.

No.	Code	Project	Researcher	Organisation
1	ABA10	Estimating the cost (production losses) of degradation to Australian agriculture – a survey approach.	Mr Colin Mues	ABARE
2	AGT8	Monitoring and Evaluation of the National Land and Water Resources Audit	Dr Peter Chudleigh	Agtrans Research
3	ANU20	Derivation of nested catchments and sub-catchments for the Australian continent	Dr M Hutchinson	Australian National University
4	BRR10	Catchment water balance and land use impacts – consultancy	Jane Coram	Bureau of Rural Sciences
5	BRR11	Catchment classification for salinity management – consultancy	Jane Coram	Bureau of Rural Sciences
6	BRR12	Land use change, Productivity and Enterprise Diversification	Dr Ann Hamblin	Bureau of Rural Sciences
7	BRR13	Access, audit and compilation of digital vegetation extent and condition data.	Mr Simon Veitch	Bureau of Rural Sciences
8	BRR14	Framework and Review of Capacity and Motivation for Change to Sustainable Management Practices	Ms Melanie Fisher	Bureau of Rural Sciences
9	BRR15	An Evaluation Framework for Dryland Salinity	Jane Coram	Bureau of Rural Sciences
10	BRR16	Integrated Social and Economic Database System for Sustainable Management: Social Atlas	Dr John Cary	Bureau of Rural Sciences
11	BRR17	Provision of Data Management Services to the Audit	Dr Steve Blake	Bureau of Rural Sciences
12	BRR9	Australian Soil Resource Information System – consultancy	Dr Colin Chartres	Bureau of Rural Sciences
13	CDM7	Using natural resource inventory data to improve the management of dryland salinity in the Great Southern, WA.	Dr Norm Campbell	CSIRO Mathematical & Information Sciences
14	CIE5	Indicators within a decision framework	Dr Jenny Gordon	Centre for International Economics
15	CIE6	Capacity for Change: Coordination and Reporting	Dr George Reeves	Centre for International Economics
16	CLW12	Water-borne soil erosion and sediment transport 2. Regional nutrient and water balance	Dr Chris Moran	CSIRO Land and Water
17	CLW13	Soil Nutrient Status	Dr Doug Reuter	CSIRO Land and Water
18	CLW14	Valuing the Resource base and costs of degradation	Mr M Young	CSIRO Land and Water
19	CLW15	Estuarine Health Assessment	Dr Richard Davis	CSIRO Land and Water
20	CLW18	Assessment of River Condition	Dr Graham Harris	CSIRO Land and Water

No.	Code	Project	Researcher	Organisation
21	CLW26	An initial assessment of catchment condition ILZ	Dr J Walker	CSIRO Land and Water
22	DAS18	Supporting and managing land use impacts and change, Mount Lofty Ranges, SA.	Dr Andrew Johnson	Department of Primary Industries, SA
23	DAS19	Extent and Impacts of Dryland Salinity	Mr Steve Barnett	Department of Primary Industries, SA
24	DAT5	Sustainable use and environmental health of Tasmania's water resources	Mr Rob Phillips	Department of Primary Ind. Water & Environment
25	DAT6	Extent and Impacts of Dryland Salinity – consultancy	Mr Colin Bastick	Department of Primary Ind. Water & Environment
26	DAV28	Regional data compilation and assessment techniques for natural resource management	Mr Victor Sposito	Department of Natural Resources & Environment (Victoria)
27	DAV29	Implementation of the surface and groundwater management – availability, allocation, use, and efficiency of use theme work plan	Ms Rae Moran	Department of Natural Resources & Environment (Victoria)
28	DAV30	Land-use mapping: East and West Gippsland Catchment Management Authority areas.	Mr Victor Sposito	Department of Natural Resources & Environment (Victoria)
29	DAV32	Structural Adjustment in Agriculture and the Capacity to Implement Catchment Plans	Mr Neil Barr	Department of Natural Resources & Environment (Victoria)
30	DAV33	Status and Trend in Surface Water Quality – consultancy	Mr Stuart Minchin	Department of Natural Resources & Environment (Victoria)
31	DAV35	Signposts for Australian Agriculture – Synthesis and Integration	Mr Victor Sposito	Department of Natural Resources & Environment (Victoria)
32	DAW27	Land-use and Vegetation Mapping: Western Australia – consultancy	Mr Greg Beeston	Agriculture Western Australia
33	DAW28	Rangelands Monitoring Theme Coordinator	Dr Ian Watson	Agriculture Western Australia

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34	DAW29	Extent and Impacts of Dryland Salinity	Mr Rod Short	Agriculture Western Australia
35	DAW30	Soil acidity and acidification	Mr P Dolling	Agriculture Western Australia
36	DEP7	Implementation of the surface and groundwater management – availability, allocation, use and efficiency of use theme work plan	Mr David Cresswell	Department of Environment, Heritage & Aboriginal Affairs
37	DET3	Indices of change in ecosystem function at the national scale using AVHRR NDVI data	Dr Shane Cridland	Environment Australia
38	DET7	Update of report and database of Water Quality Monitoring in Australia – consultancy	Dr Charles Lewis	Environment Australia
39	DNR5	Queensland: Specify framework database	Mr Graeme Lacey	Queensland Department Natural Resources
40	DRD4	National Dairy Land & Water Audit: Sustaining our Natural Resources	Peter R Day	Dairy R&D Corporation
41	EAR1	Development, Improvement, Updating and Maintenance of National Land and Water Resources Audit WebSite – consultancy	Dr Dave Johnson	EarthWare Systems
42	EAR3	Provision of communication services to Audit (Electronic information products, display and presentation material, subprogram coordination)	Dr Dave Johnson	EarthWare Systems
43	EAR5	Web Reporting System	Dr Dave Johnson	EarthWare Systems
44	ELP3	Implementation of the surface and groundwater management – availability, allocation, use, and efficiency of use theme work plan	Mr Gary Croston	Department of Urban Services
45	ELP4	Status and Trend in Surface Water Quality – consultancy	Mr Gary Croston	Department of Urban Services
46	FOX1	Design & Development of an Audiovisual Presentation for the National Land and Water Resources Audit	Mr Peter Fox	Beaten Track Press
47	GBS1	Development of a data management operational plan – consultancy	Mr Ian Musto	Geographic Business System
48	GMO1	Landscape Health Assessment	Mr Gethin Morgan	Gethin Morgan
49	GRI1	Development of the Business Plan for Stage 2 of the National Vegetation Information System	Dr Kate Duggan	Griffin nrm Pty Ltd
50	NDW27	Implementation of the surface and groundwater management – availability, allocation, use, and efficiency of use theme work plan	Mr D Malone	Department of Land & Water Conservation

No.	Code	Project	Researcher	Organisation
51	NDW29	Status and trends in surface water quality	Mr Richard Denham	Department of Land & Water Conservation
52	NTU4	Developing an analytical framework for monitoring biodiversity in Australia's rangelands	Mr John Childs	Northern Territory University
53	PWA2	Implementation of the surface and groundwater management – availability, allocation, use, and efficiency of use theme work plan	Dr John Childs	Department of Lands, Planning & Environment
54	QNR15	Developing farming systems and improving catchment health in the Fitzroy, Queensland	Dr Don Yule	Queensland Department of Natural Resources
55	QNR16	Implementation of the surface and groundwater management – availability, allocation, use, and efficiency of use theme work plan	Mr Graham Oehlerich	Queensland Department of Natural Resources
56	QNR17	Land Use Mapping: Fitzroy Catchment	Dr Don Yule	Queensland Department of Natural Resources
57	QNR18	Intensity of land use	Dr Wayne Hall	Queensland Department of Natural Resources
58	QNR20	Change in Land Tenure/Land Use	Dr Wayne Hall	Queensland Department of Natural Resources
59	QNR21	Extent and Impacts of Dryland Salinity	Mr Robert Ellis	Queensland Department of Natural Resources
60	QNR22	Status and Trends in Surface Water Quality – consultancy	Mr Tony Horn	Queensland Department of Natural Resources
61	REA1	Dryland Salinity – Socio-Economic Case Studies – consultancy	Mr Mike Read	Read Sturgess & Associates
62	RJC1	Coordination – Agricultural Productivity and Sust	Dr Bob Crouch	Bob Crouch Consulting
63	RPM1	Plain English summaries of regional information for Rangelands Monitoring WebSite	Mr Roland Breckwoldt	Resource Policy and Management Consultants
64	SKP6	Coordinator – Water Availability	Mr P Erlanger	Sinclair Knight Merz
65	SKP7	Extent and Impacts of Dryland Salinity – consultancy	Mr Craig Clifton	Sinclair Knight Merz
66	SKP9	Ecosystem Health – Riverine Vegetation Scoping Exercise	Associate Professor Paul Boon	Sinclair Knight Merz
67	SKT1	Benchmarking current rural industry practices, productivity, environmental impact and assessing the capacity to implement change	Mr Robert Walker	Sinclair Knight Merz Pty Ltd, Toowoomba

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68	THA2	Provision of communication services to Audit (print products)	Ms Robin Jean	Themeda
69	UME61	Extension of Unimpaired Monthly Streamflow Data and Regionalisation of Parameter Values to Estimate Streamflow in Ungauged Catchments	Dr Francis Chiew	University of Melbourne
70	WEB4	Audit Dryland Salinity Project Coordinator – consultancy	Mr Adrian Webb	WEBBNET Land Resource Services Pty Ltd
71	WRC8	Implementation of the surface and groundwater management – availability, allocation, use, and efficiency of use theme work plan	Mr Roy Stone	Water and Rivers Commission (WA)
72	WRC9	Status and Trend in Surface Water Quality – consultancy	Mr Robert Donohue	Water and Rivers Commission (WA)
Sustainable Grazing Systems				
73	MRC4	Sustainable grazing systems key Program	Ms G Kay	Meat & Livestock Australia
Climate Variability in Agriculture Program				
74	AGE1	Program management for the Climate Variability Research and Development Program	Dr Barry White	AGEC Consulting
75	AGE2	CVAP Communication Coordination	Dr Barry White	AGEC Consulting
76	BOM3	A century's perspective on climate variability and impacts on agriculture	Dr Scott Power	Bureau of Meteorology
77	BOM4	Improved climate prediction during El Nino events	Dr William Wright	Bureau of Meteorology
78	BOM5	Effective implementation, adoption and utilisation of new climate model results	Ms Mary E Voice	Bureau of Meteorology
79	BRR7	Framework for analysing climate variability for policy	Dr Greg Laughlin	Bureau of Rural Sciences
80	CAG1	Mid-term review of the Climate Variability in Agriculture Program	Mr Noel Beynon	Capital Ag
81	CIC3	Search for innovative adaptations to climate variability	Mr Tim Powell	Cox Inall Communications
82	COR5	Extended seasonal climate predictions using a dynamic climate model	Dr G Meyers	CSIRO Marine Research
83	CPA1	Climate Variability in Agriculture R&D Program – Communication Package	Mr Thomas Parkes	Capital Public Affairs Consultants
84	CTC16	From oceans to farms: integrated management of climate variability	Dr Andrew Ash	CSIRO Tropical Agriculture
85	CTC18	Better management of climate variability within the agribusiness service sector	Dr Peter S Carberry	CSIRO Tropical Agriculture

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86	CWE23	Do government policy instruments support sustainable grazing on-farm?	Dr Mark Stafford - Smith	CSIRO Wildlife & Ecology
87	HRM1	Improved management of climate variability on Australian grain farms	Mr Peter Wylie	Horizon Rural Management
88	QNR14	Can seasonal climate forecasting prevent degradation of Australia's grazing lands?	Dr Greg McKeon	Queensland Department of Natural Resources
89	QNR9	Australian Grassland and Rangeland Assessment by Spatial Simulation – 'Aussie GRASS'	Mr K Brook	Queensland Department of Natural Resources
90	QPI42	International workshop on farm management decisions with climatic risk	Mr Rod Saal	Queensland Department of Primary Industries
91	QPI43	CLIMARC – Computerising the Australian climate archives	Mr Nick Clarkson	Queensland Department of Primary Industries
92	QPI44	Can decadal variability (DCV) impact on cropping systems management	Dr Holger Meinke	Queensland Department of Primary Industries
93	UQL20	Seasonal climate information and farmers' risk assessment and decision-making	Dr Lenard Dalgleish	University of Queensland
94	UWA21	Innovative workshops to improve understanding of price and climate variability	Dr Ross Kingwell	University of Western Australia
95	VCE14	Strategies to cope with climatic variability in the perennial pasture zone of south eastern Australia	Mr Stephen G Clark	Department of Natural Resources & Environment
96	VIR5	Improving the communication of climate information to dairy farmers	Mr Greg Hayes	VCG Australia Pty Ltd
National Dryland Salinity R&D Program				
97	CWW27	National Dryland Salinity Program State Communication Coordinator – Western Australia	Ms Margaret Bryant	CSIRO Land & Water – Perth
98	DAS16	Willalooka Wetlands Project: sustainable pasture production systems in a region of shallow watertables and seasonally flooded wetlands	Mr R Ebsary	Department of Primary Industries, SA
99	DEP8	Program Coordinator – National Dryland Salinity Program	Mr Nicholas Newland	Department of Environment, Heritage & Aboriginal Affairs
100	EAR4	Webmaster for the NDSP WebSite	Dr Dave Johnson	EarthWare Systems

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101	ECO4	National Dryland Salinity Program State Communications Coordinator – Queensland	Ms Jenni Metcalfe	ECONNECT
102	GRD5	One million hectares for the future	Dr W Porter	Grains R&D Corporation
103	GRD6	Farming systems with lower recharge for WA	Dr W Porter	Grains R&D Corporation
104	MDB7	Determining the costs of dryland salinity – Phase II	Mr Richard Ivey	Murray-Darling Basin Commission
105	MUN1	National Dryland Salinity Program State Communication Coordinator – South Australia	Dr Bruce Munday	Clear Connections
106	PPK1	Assessment of options for the productive use of saline lands	Dr David Cruickshanks-Boyd	PPK Environment & Infrastructure Pty Ltd
107	RMI7	Complementary data and cost benefit analysis of utilising airborne geophysics	Mr Peter Woodgate	Royal Melbourne Institute of Technology
108	RPD1	Local government capacity to manage dryland salinity	Mr Trevor Budge	Research Planning Design Group
109	SCS12	National Dryland Salinity Program State Communication Coordinator – New South Wales	Ms Ann Newling	Department of Land & Water Conservation
110	SKP8	Assessment of the efficacy of engineering solutions for management of dryland salinity	Mr Chris McAuley	Sinclair Knight Merz
111	SPC1	National Dryland Salinity Program State Communication Coordinator – Victoria	Ms Jo Curkpatrick	SPAN Communication
112	SPC2	Review of the use of focus catchments in Phase I of the National Dryland Salinity Program	Ms Jo Curkpatrick	SPAN Communication
113	UWA16	Why is dryland and water salinisation still a major environmental problem?	Ms E Kington	University of Western Australia
114	VIR6	Enhancing institutional support for the management of dryland salinity	Mr Greg Hayes	VCG Australia Pty Ltd
North Australia Program				
115	MRC5	North Australia Program: Phase 3	Mr P Loneragan	Meat & Livestock Australia
Redesigning Agriculture for Australian Landscapes R&D Program				
116	CDS20	Manipulating water and nutrient uptake to minimise leaching	Dr W Bond	CSIRO Land and Water

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117	CPI7	Innovative soil and water management for sustainable agriculture in the Mediterranean climatic zone – WA	Dr Ian R P Fillery	CSIRO Plant Industry
118	CPI8	Modelling the processes which result in soil acidification in Australian landscapes	Dr R Simpson	CSIRO Plant Industry
119	CPI9	Linkage of Grazplan Pasture/Animal Models to APSIM Crop/Soil Models and the SWIM Water Balance	Dr Andrew Moore	CSIRO Plant Industry
120	CTC11	A modelling framework to assess performance of natural and managed systems	Dr B Keating	CSIRO Tropical Agriculture
121	SPV1	RAPPS Program Coordinator David Clarke – Sustainable Productions	Mr David Clarke	EFECT Pty Ltd
122	UWA18	Water and nitrogen economies of native plant communities and comparison with agricultural systems in WA.	Professor John S. Pate	University of Western Australia
R&D for Environment Management of Military Lands Program				
123	CTC12	Environmental management of military training areas	Dr John McIvor	CSIRO Tropical Agriculture
124	CTC19	Constructing decision support tools to evaluate management alternatives	Dr Andrew Ash	CSIRO Tropical Agriculture
125	CTC20	Dr Robert Shaw – Travelling Fellowship	Dr Robert Shaw	CSIRO Tropical Agriculture
126	CTC23	Military Decision Support: Manual and Training	Dr Andrew Ash	CSIRO Tropical Agriculture
Social and Institutional Research Program				
127	ANU11	Citizens' juries for environmental management: an alternative to CBA?	Dr R Blamey	Australian National University
128	ANU17	Processes and institutions for resource and environmental management: Australian experiences	Dr Steve Dovers	Australian National University
129	ANU18	Environmental science: from independent experts to post-modern process managers	Lorrae van Kerkhoff	Australian National University
130	ANU21	Enhancing the information base on participatory approaches in NRM	Dr H Ross	Australian National University
131	ANU22	Social and institutional implications of landscape and land use change	Dr D Lindenmayer	Australian National University

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132	BOR1	National Coordination of the Social and Institutional Research Program	Mr Kenneth J Moore	Boorara Management and Consulting
133	CAG2	Conceptual frameworks for analysing effective policy relationships between players in the field of NRM	Mr Noel Beynon	Capital Ag
134	CCQ1	1999 International Symposium on Society and Resource Management	Ms Sally Brown	Conference Connections
135	CCQ2	Multiple Objective Decision Support Systems Conference (MODSS 99)	Ms Paula Collins	Conference Connections
136	CLW24	Methodological reviews of NRM assessment techniques	Mr Mike Young	CSIRO Land and Water
137	CTC7	Evaluation of integrated catchment management in a wet tropical catchment	Mrs Jenny Bellamy	CSIRO Tropical Agriculture
138	CWA20	Development of an Integrated Catchment Management Software (ICMS) package	Dr Bill Young	CSIRO Land & Water – Canberra
139	CWE17	Decision points for land and water futures	Mr Barney Foran	CSIRO Wildlife & Ecology
140	CWE18	Spatio-temporal effectiveness of natural resource and rural adjustment policies	Romy Greiner	CSIRO Wildlife & Ecology
141	GRU21	Farm decision-making and resource use: new structures and changing responsibilities	Dr DF Burch	Griffith University
142	IRM2	Catchment Information System: distribution and publication	Dr Bruce Hooper	Integrated Resource Management Pty Ltd
143	RSA1	Design, implementation and maintenance of LWRRDC's Social and Institutional Research Program WebSite	Maurice Height	Rubicon Software Support
144	SYN1	Participatory research methodologies in NRM	Mr Tony Gleeson	Synapse Agric & Resource Consulting
145	TPF1	Methodology for NRM law-in-context studies	Mr Peter Martin	The Profit Foundation
146	UME29	Integration of research and development in catchment management	Prof. Tom A. McMahon	University of Melbourne
147	UMU14	Interdisciplinary research methodologies in NRM	Assoc. Prof. P Newman	Murdoch University
148	UNE35	Ecological and social functions influencing governance of natural resources	Dr David Brunckhorst	University of New England
149	UQL21	Integrating cross-jurisdictional planning and assessment for sustainable regions	Mr Geoff McDonald	University of Queensland

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150	USA3	Sustainability with profitability: Rural Adjustment via water markets	Dr Jennifer McKay	University of South Australia
151	USQ3	Conceptual frameworks for analysing effective NRM policies and programs	Professor Charlie Zammitt	University of Southern Queensland
152	UTA11	Building the knowledge base of the social and institutional dimensions of NRM	Dr Elaine Stratford	University of Tasmania
153	UWO4	The effectiveness of the integration of water and land use planning	Ms Carla Mooney	University of Wollongong
National Eutrophication Management Program				
154	AGS2	Nutrients in Wilson Inlet: are sediments a major source of nutrients for biomass production?	Dr David Heggie	Australian Geological Survey Organisation
155	AGT7	Review of National Eutrophication Management Program	Dr Peter Chudleigh	Agtrans Research
156	ANU9	Sources and delivery of suspended sediment and phosphorus to four Australian Rivers: Part B. Nd and Sr isotopes and trace elements	Dr Candace Martin	Australian National University
157	AQU3	Consultancy into the cost of algal blooms to selected water user groups in Australia	Peter Dempster	Atech Group Pty Ltd
158	AQU5	Scoping study for a National River Contaminants Program	Dr Bob Banens	Atech Group Pty Ltd
159	BEY1	National Eutrophication Management Program (NEMP) Communications Coordinator	Ms Vivienne McWaters	Beyond the Edge Pty Limited
160	CLW16	A quantitative basis for setting flows to control algal blooms in the Fitzroy Basin	Dr Myriam Bormans	CSIRO Land and Water
161	CLW2	Whole-lake biomanipulation for the reduction of nuisance micro-algae	Dr V Matveev	CSIRO Land and Water
162	CWA18	NEMP Program Coordinator – Richard Davis	Dr Richard Davis	CSIRO Land & Water – Canberra
163	CWA21	Sources and delivery of suspended sediment and phosphorus to Australian Rivers: Part A. Radionuclides and Geomorphology	Dr Cathy Wilson	CSIRO Land & Water – Canberra
164	GMW2	Eutrophication related coordination in the Goulburn-Broken catchment	Mr Pat Feehan	Goulburn-Murray Water
165	MDR17	Algal availability of phosphorus discharged from different catchment sources	Dr Rod Oliver	Murray Darling Freshwater Research Centre
166	QNR5	Eutrophication related coordination in the Fitzroy catchment	Mr Peter G Thompson	Queensland Department of Natural Resources

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167	UMO36	Nutrient release from river sediments: Phase II validation and application of sediment-release model	Prof. Barry Hart	Monash University
168	UOC12	Physical and nutrient factors controlling algal succession and biomass in Burrinjuck reservoir	Dr Ian Lawrence	University of Canberra
169	WRC2	Eutrophication related coordination in the Wilson Inlet catchment	Mr Malcolm Robb	Water and Rivers Commission (WA)
National Groundwater R&D Program				
170	ALL1	Allison Partners Pty Limited – Groundwater Program Coordinator	Dr Graham Allison	Allison Partners Pty Limited
171	CLW19	Development of community education and training programs in groundwater management	Dr Chris Barber	CSIRO Land and Water
172	CLW7	Biogeochemical processes induced by groundwater – surface water interactions	Dr A Herczeg	CSIRO Land and Water
173	CLW8	Guidelines for managing groundwater for vegetation health in saline areas	Dr Glenn Walker	CSIRO Land and Water
174	JCU14	Riparian and instream vegetation requirements of baseflows from basalt aquifers	Mr George Lukacs	James Cook University
175	MAE1	Groundwater recharge and flow velocities in fractured rock aquifers	Mr Andrew Love	Department of Primary Industries & Resources SA
176	NDW23	Optimising groundwater usage to mitigate native vegetation decline in the Namoi valley	Mr Phillip Kalaitzis	Department of Land & Water Conservation
177	NDW28	Influence of fractures on groundwater flow in an urban saline catchment, Wagga Wagga	Mr Michael Williams	Department of Land & Water Conservation
178	PPK2	Groundwater Program Review and Development of Strategic Plan	Mr John Ross	PPK Environment & Infrastructure Pty Ltd
179	QNR13	Investigation, assessment and management of groundwater supplies – Atherton Tableland Basalts	Mr Bruce R Pearce	Queensland Department of Natural Resources
180	WRC7	Underground water pollution control – introduction of market rights for water extraction and contamination control in Western Australia	Mr Russell King	Water and Rivers Commission (WA)
National Program for Irrigation R&D				
181	ABA9	Economic benefits of improved irrigation efficiency	Ahmed Hafi	ABARE
182	ALL2	Coordination of R&D investments in irrigation environmental impacts	Dr Graham Allison	Allison Partners Pty Limited

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183	CDH2	Improving the water use efficiency of horticultural crops	Dr Brian Loveys	CSIRO Plant Industry – Horticulture Unit
184	CID1	Benchmarking irrigation service providers	Mr John Mapson	Australian National Committee on Irrigation & Drainage
185	CLW11	A new method for bench-marking salt and nitrate leaching	Dr Richard Stirzaker	CSIRO Land and Water
186	CLW20	Best management practices for sub-surface drainage design and management	Dr Evan Christen	CSIRO Land and Water
187	CLW21	Rigorously determined water balance benchmarks for irrigated crops and pastures	Dr Elizabeth Humphreys	CSIRO Land and Water
188	CLW23	An information package on soil moisture monitoring	Dr Elizabeth Humphreys	CSIRO Land and Water
189	CSU14	An evaluation of sub-surface irrigation configurations	Mr Philip Charlesworth	Charles Sturt University
190	CTC10	Guidelines for efficient and sustainable trickle irrigation systems	Dr Keith L Bristow	CSIRO Tropical Agriculture
191	CWN13	Determination of optimal irrigation intensity for irrigation areas	Mr John Madden	CSIRO Land & Water – Griffith
192	DAN11	Improving water use efficiency by reducing groundwater recharge under irrigated pastures	Mr Hayden Kingston	NSW Agriculture
193	DAN14	Determining 'Whole-of-System' water use efficiencies for NSW River Valleys	Dr Nick Austin	NSW Agriculture
194	DAV23	Alternative irrigation technologies in field cropping to increase water use efficiency	Mr Mike Schulz	Department of Natural Resources & Environment (Victoria)
195	DAV34	Visiting Fellow – Polyacrylamides in Irrigated Agriculture	Dr Bob Sojka	Department of Natural Resources & Environment (Victoria)
196	GMW3	Benchmarking the distribution efficiency of an irrigation supply system	Mr Kevin J Preece	Goulburn-Murray Water
197	GMW6	Nutrient removal from rural drainage systems using wetlands	Mr Ross Plunkett	Goulburn-Murray Water
198	GMW7	National Workshop – Management of nutrients and sediment in irrigation return water	Mr John Mapson	Goulburn-Murray Water
199	GRD3	Irrigated cropping advance 2000: industry development and implementation of best practice	Dr T David Ugalde	Grains R&D Corporation

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200	MCS1	NPIRD Program Coordinator	Mr Brett Tucker	Murrumbidgee Consultancy Services
201	MDB8	Review of natural resource planning and implementation processes used in selected irrigation regions throughout Australia, but primarily within the Murray Darling Basin, over the last 15 years	Mr Klaas Smit	Murray-Darling Basin Commission
202	MDB9	Development of guidelines for quantification and monitoring of seepage from earthen channels	Mr P Jackson	Murray-Darling Basin Commission
203	MIL1	Improving hydraulic efficiency of irrigation and drainage systems through benchmarking	Mr David K Watts	Murray Irrigation Limited
204	NRE1	Irrigation Program Communications Coordinator – Naturally Resourceful	Ms Anne Currey	Naturally Resourceful Pty Limited
205	QPI26	Nutrient control in irrigation drainage systems using artificial wetlands	Mr George Lukacs	Queensland Department of Primary Industries
206	RMG1	Irrigation risk management in the current and future water policy environment	Mr Charles Thompson	Rendell McGuckian Agric. & Mng Consultants
207	UME58	Improving the efficiency and flexibility of contour irrigation design	Dr Hector Malano	University of Melbourne
208	UME60	Client needs in relation to irrigation and natural resource management	Dr Hector Malano	University of Melbourne
209	UNE39	Improving water quality from subsurface drainage systems in irrigated agriculture	Dr Evan Christen	University of New England
210	UNS26	Water quality sustainability in groundwater abstraction for irrigation	Ms Wendy Timms	University of New South Wales
211	WTR1	NPIRD WebSite	Mr Dillon Brice	Wolf Tracks
National Rivers Consortium (incorporating Riparian Lands)				
212	CIE7	Preparation of a Strategic and Action Plan for the National Rivers Consortium	Dr Jenny Gordon	Centre for International Economics
213	CLW17	Research Officer for the National Rivers Consortium	Dr Peter Wallbrink	CSIRO Land and Water
214	EDG1	NRC Program Consultant	Mr Brendan Edgar	Edgar & Partners
215	EPN2	Environmental values of NSW rivers	Prof. Jeff Bennett	Environment Protection Authority, NSW

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216	INT3	Information exchange and capacity building for river restoration and protection	Mr Kevin Balm	Integra Pty Ltd
217	VCE15	Development of a framework for river restoration	Mr John Koehn	Department of Natural Resources & Environment
218	VCE16	Development and testing of the National River Restoration Framework	Mr John Koehn	Department of Natural Resources & Environment
219	BCW1	Demonstration/Evaluation of Riparian Restoration in the Blackwood Catchment	Ms Alice Karafilis	Blackwood Catchment Coordinating Group
220	BVS1	Demonstration/evaluation of riparian restoration in the Far South Coast of NSW catchments	Mr Don McPhee	Bega Valley Shire Council
221	CLA1	Demonstration/evaluation of riparian management in the Clarence Catchment of NSW	Mr Royce Bennett	Clarence Catchment Management Committee
222	CWA15	Rehabilitation and management of riparian lands: aspects of physical and chemical processes (Program A)	Dr Ian Prosser	CSIRO Land & Water – Canberra
223	DAT3	Management of Stock Access to Riparian Zones	Mr Ian Bell	Department of Primary Ind. Water & Environment
224	GRU17	Rehabilitation and management of riparian lands: ecological issues (Program B)	Professor Stuart Bunn	Griffith University
225	JRC1	Demonstration/evaluation of riparian restoration in the Johnstone River catchment	Peter Gleeson	Johnstone River Catchment Management Association
226	MAR1	Demonstration/evaluation of riparian management in the Mary River catchment	Mr Brian Stockwell	Mary River Catchment Coordinating Committee
227	NHT1	Production of a CD-ROM on River Restoration and Management	Mr Malcolm Cowan	Noble House Tasmania Pty Limited
228	OHW1	Demonstrate/evaluate practical methods of riparian rehabilitation on salinised lands	Mr Bruce Radys	Oyster Harbour Catchment Group
229	PPM2	River Ramblers	Ms Hilary Huggan	Pacific Projects Management Pty Limited

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230	SIW1	Riparian Lands R&D Program Coordinator	Dr Siwan Lovett	Lovett Clarke Consulting Pty Ltd
231	UOG1	Visiting fellowship in Holistic River Restoration	Dr Jack Imhof	University of Guelph
232	VIR7	Riparian Program Evaluation	Mr Greg Hayes	VCG Australia Pty Ltd
National River Health Program				
233	AWT2	Evaluation of attached diatoms for assessment of river health	Dr Bruce Chessman	Australian Water Technologies
234	BIO1	Communication Consultant – Water Resources	Mr Russell Moran	Biota
235	CWW21	Interactive justice and community management of environmental stream flows	Dr G Syme	CSIRO Land & Water – Perth
236	FWS1	Program Coordinator Consultancy	Dr Peter Davies	Freshwater Systems
237	JCU12	Taxonomy of the Leptophlebiidae (Ephemeroptera) of North-Eastern Queensland	Ms Faye Christidis	James Cook University
238	MDR13	Riverine and floodplain interactions during high flow	Dr T Hillman	Murray Darling Freshwater Research Centre
239	MQL2	Measurement of river health using rapid microbial biodiversity assessment	Dr D Veal	Macquarie Research Limited
240	UAD15	An iconograph of common stream diatoms from temperate Australia	Dr Peter Gell	University of Adelaide
241	UMO27	Impact of flow manipulation on the biota of a lowland river	Dr Paul Humphries	Monash University
242	UMO29	Taxonomy and Phylogeny of selected Australian Leptophlebiid mayflies (Ephemeroptera)	Ms Kyla Finlay	Monash University
243	UOC8	In-stream processes and environmental flow requirements for the Barwon-Darling River	Dr Fran Sheldon	University of Canberra
244	UQL14	Bacterial diversity in tropical and sub-tropical lowland, regulated rivers	Ms Tracy Cox	University of Queensland
245	VCB1	Time share flooding of aquatic ecosystems – strategy assessment	Mr Keith Ward	Department of Natural Resources & Envir. (North-East Area)
246	QPI31	Monitoring River Health Initiative – Queensland Program	Mr Peter G Thompson	Queensland Department of Primary Industries
247	UOC14	AUSRIVAS mapping and reference site screening module	A/Prof. Richard Norris	University of Canberra

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National Wetlands R&D Program				
248	DET1	Management of the National Wetlands R&D Program	Ms Alison Shepherd	Environment Australia
Joint Venture Agroforesty Program				
249	RDC1	RIRDC/LWRRDC joint agroforestry Program	Dr Roslyn Prinsley	Rural Industries R&D Corporation
National Rangelands R&D Program				
250	ADF2	Culture, nature and environmental management in central Australian rangelands	Mr Nicholas J Gill	Australian Defence Force Academy
251	ANU8	Regional resource use planning: the potential and limits of adaptive and collaborative approaches	Ms Cathy Mobbs	Australian National University
252	CAG3	Rangelands R&D Program: Review of Regional Resource Planning Projects	Mr Noel Beynon	Capital Ag
253	CTC13	Regional resource use planning in rangelands: a Central Queensland pilot study	Dr Allan Dale	CSIRO Tropical Agriculture
254	CWE11	Patterns of sustainable use of rangelands for the 21st century	Dr Nick Abel	CSIRO Wildlife & Ecology
255	CWE16	Biological and economic consequences of managing water-point distribution in rangelands	Dr Craig James	CSIRO Wildlife & Ecology
256	DAW21	Effective planning procedures for ecologically sustainable land use in the rangelands	Mr Alec Holm	Agriculture Western Australia
National Remnant Vegetation R&D Program				
257	ANU6	The role of corridors and retained vegetation in biodiversity conservation	Dr D Lindenmayer	Australian National University
258	CTC9	Applying management principles in variegated landscapes: identifying production:conservation tradeoffs	Mr Neil Macleod	CSIRO Tropical Agriculture
259	SES1	Remnant Vegetation R&D Program Coordinator	Dr Jann Williams	Sustainable Environmental Systems
260	UTA4	Guidelines for the maintenance and improvement of remnant bush in Tasmania	Prof. Jamie Kirkpatrick	University of Tasmania
261	VCA2	Socioeconomic and ecological benchmarks for the evaluation of remnant vegetation	Mr Chris Williams	Victorian College of Agriculture & Horticulture

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General Call				
262	ADF5	Private sector natural resource management	Stuart Whitten	Australian Defence Force Academy
263	ANU12	Sustainable Resource Management: Consumers' Preferences or Citizens' Deliberations	Mr Simon Niemeyer	Australian National University
264	ANU14	Innovation by resource management institutions: Australia, New Zealand, North America	Mr John Dore	Australian National University
265	CDS17	A toolkit for hydraulic properties of Australian soils	Dr Hamish Cresswell	CSIRO Land and Water
266	CEN4	Introducing earthworms to reduce soil acidity and increase pasture production	Dr G Baker	CSIRO Entomology
267	CLW10	Mid-infrared spectroscopy for rapid prediction of soil physical properties	Mr R Merry	CSIRO Land and Water
268	CLW22	Improved understanding of drainage water quality towards sustainable agricultural production systems	Professor Jan W Hopmans	CSIRO Land and Water
269	CSU21	Integrating nature conservation and production agriculture: lessons for Australia based on an international tour	Prof. D Goldney	Charles Sturt University
270	CTC17	Improved Integrated Resource Use Planning in the Australian Sugar Industry	Dr Andrew Johnson	CSIRO Tropical Agriculture
271	CTC21	Development of a Business Plan for the Establishment of a Program of Research in North-West Australia	Dr Andrew Johnson	CSIRO Tropical Agriculture
272	CWE26	The nature and value of Australia's ecosystem services	Dr Gretchen Daily	CSIRO Wildlife & Ecology
273	CWS11	Assessing probabilities of natural inflows to large catchments 3–18 months in advance	Professor H J Simpson	CSIRO Land & Water – Adelaide
274	DAV22	Development of bacterial inoculants for enhanced root development of temperate perennial pasture grasses	Dr P Mele	Department of Natural Resources & Environment (Victoria)
275	DAV31	A Decision Support System to Identify Soil Acidity and Acidification: Publication	Ms C Hollier	Department of Natural Resources & Environment (Victoria)
276	DAW3	Forage plants for recharge control	Mr EVC Lefroy	Agriculture Western Australia

No.	Code	Project	Researcher	Organisation
277	DRD1	Optimising phosphorus use for dairy pastures in New South Wales	Mr E Havilah	Dairy R&D Corporation
278	DUV4	Land retirement as a conservation policy	Mr Phillip Hone	Deakin University
279	GRU24	Subtropical Grasslands: structure, diversity and landscape function	Katina Best	Griffith University
280	HAS4	Greenhouse, Carbon Trading and Land Management		Hassall and Associates Pty Ltd
281	SRC3	Quantifying the socio-economic impact of harvesting residue retention systems	Ms Jill Windle	Sugar R&D Corporation
282	UME32	Landcare – The Next Generation: a model for sustainable agriculture in Australia	Mr Don Thomson	University of Melbourne
283	UMO37	Monitoring protocols for assessing impacts and restoration in highly mobile terrestrial animals	Dr Ralph MacNally	Monash University
284	UMU11	Making decisions for agricultural sustainability: scale as a critical influence	Ms Susan Jennings	Murdoch University
285	UMU12	Understanding the recruitment biology of vegetation communities on saline soils	Ms Michelle Carey	Murdoch University
286	UNE36	Meeting the need for function-based assessments of soil biological health	Dr Keith J Hutchinson	University of New England
287	UNE37	National audit of changes in farmers' environmental attitudes since 1991	Mr I Reeve	University of New England
288	CLN1	Participatory rural appraisal and planning: innovative methods of working with Aboriginal land managers	Ms Fiona J Walsh	Central Land Council
289	ESA1	Ecological Management and Restoration Journal	Dr Jann Williams	Ecological Society of Australia
290	MQU7	Plant functional types: grazing, fire and global warming in rangelands	Peter Anton Vesk	Macquarie University
291	AGS5	Denitrification of sediments	Dr David Fredericks	Australian Geological Survey Organisation
292	AQU4	Review of the Delivery Mechanisms for LWRRDC Water Programs	Peter Dempster	Atech Group Pty Ltd
293	CAN1	Ecotoxicological techniques for detecting stress in an ecosystem – Travel Fellowship	Ms Edyta Jasinska	University of Calgary
294	CWS10	Characterising flow systems in fractured rock aquifers	Dr William E Sanford	CSIRO Land & Water – Adelaide
295	CWW28	Equity and other social implications in the allocation of groundwater for sustainable management	Ms Blair Nancarrow	CSIRO Land & Water – Perth
296	DAN13	Hydrologic effects of floodgate management on coastal floodplain agriculture	Mr Peter Slavich	NSW Agriculture

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297	DUV5	Improved understanding of drainage water quality towards sustainable agricultural production systems	Dr Andrew Bennett	Deakin University
298	GRU26	Flow-related responses of floodplain vegetation in arid, inland catchments	Professor Stuart Bunn	Griffith University
299	JCU15	Stream stabilisation and restoration	Mr Ross Kapitzke	James Cook University
300	MQU6	River styles as a tool for water resources management	Dr Gary Brierley	Macquarie University
301	UAD13	Triglochin procerum: an indigenous macrophyte for waste water purification	Ms M Bald	University of Adelaide
302	UMO35	Distribution of fish larvae and identification of nursery habitats in floodplain rivers	Ms Alison King	Monash University
303	UNE29	Nutrient removal and fertiliser value of sewage biosolids	Ms Jean Davis	University of New England
304	UNS25	National framework for the management of Australian estuaries	Dr Wayne Erskine	University of New South Wales
305	UTA9	The impact of introduced trout on aquatic ecosystems in Australia	Mr William Elvey	University of Tasmania
306	UTS5	The effect of the pesticide endosulfan on macoinvertebrate communities in stream mecocosms	Mr Grant Hose	University of Technology, Sydney
307	UWA22	Arid zone fish ecology: the importance of floodplain connections	Dr Peter M Davies	University of Western Australia
308	UWO3	Process variability in river systems, south-east Australia: implications for river rehabilitation	Mr Timothy Cohen	University of Wollongong
LWRRDC Communication				
309	CIC4	National Program for Irrigation for Research and Development (NPIRD) – Communication Audit	Mr Tim Powell	Cox Inall Communications
310	INF6	Streamline Database 1998–2001	Ms Pam Handyside	Infoscan Pty Ltd
311	SOF1	Design/development/maintenance/evaluation of the LWRRDC WWW home page	Mr Chris Deal	Softlaw Corporation Pty Ltd
312	THA4	Production of 1999 Stakeholders Report	Ms Robin Jean	Themeda
LWRRDC Management				
313	DEX2	Supply of IT support to LWRRDC and Audit for 1998/99–2000/01.	Mr Rowan Lane	Dextra Systems
314	AGT6	Synthesis of Impact of Research Consultancies	Dr Peter Chudleigh	Agtrans Research

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315	SCK3	Assessing the Impact of Research Projects Related to Australia's Natural Resources – Update	Mr Peter H Sloane	Sloane Cook & King Pty Ltd
316	TEM2	Assessing the Impact of Research Projects Related to Australia's Natural Resources 2nd Update	Prof. C. Tisdell	Temtac Pty Ltd
317	AQU6	Development of a data management framework for LWRRDC	Mr Laslo Nagy	Atech Group Pty Ltd
318	CQS3	Internal quality auditing	Mr Murray Feddersen	CQS Australia
319	CSC1	Assessment and optimisation of LWRRDC's Information Technology and Information Management Processes.	Mr Andrew Ford	CSC Australia Pty Ltd
320	CWA28	Estimation of the scale of management solutions required in natural resource management: continental scale	Dr Neil McKenzie	CSIRO Land & Water – Canberra
321	DEX4	Development of a new Project Management System for LWRRDC	Mr Rowan Lane	Dextra Systems
322	MCC1	Framework and Process for Developing LWRRDC's New Strategic Plan	Dr Ian McCausland	McCausland Associates
323	MCG1	Program Coordinator (Various LWRRDC Programs)	Dr Phil Price	Mackellar Consulting Group
324	RDC9	Review of R&D activities in the area of sustainable agri-industry	Dr Warren Mason	Rural Industries R & D Corporation
325	VIR8	Quantifying the Case for Public Investment in Natural Resource Management and Environmental Sustainability	Mr B Madden	VCG Australia Pty Ltd
326	VIR9	Management of LWRRDC's Strategic Planning Process 2001–06	Mr Greg Hayes	VCG Australia Pty Ltd

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